26/10/26

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NATIONAL MUSEUM MELBOURNE

The Journal of the Department of Agriculture of Victoria, Australia.

October, 1926.

PRINCIPAL CONTENTS

Co-operative Freezing for Export

Improvement of Soil Texture

Profitable Sheep Farming

Native Insect Pests of the Orchard and Garden

Experiments in Potato Cultivation

An Inquiry into Vine Grafting

Planting and Pruning of Fruit Trees

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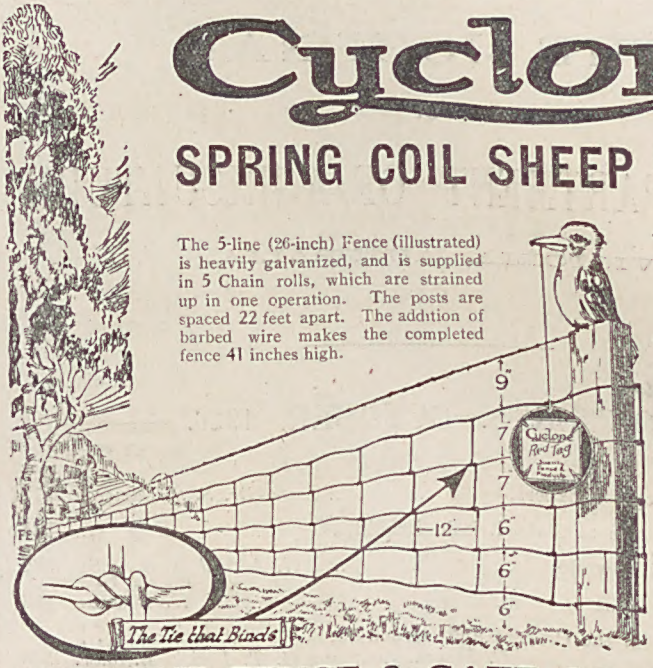

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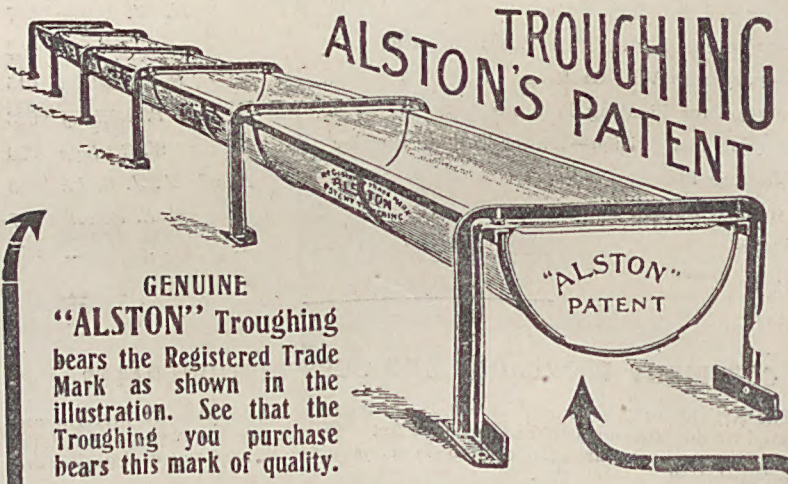

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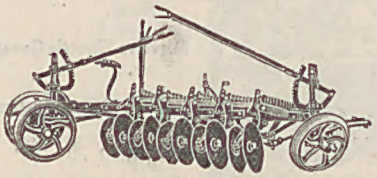

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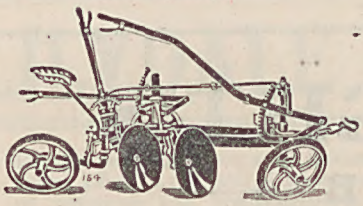

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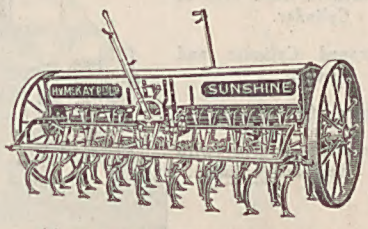

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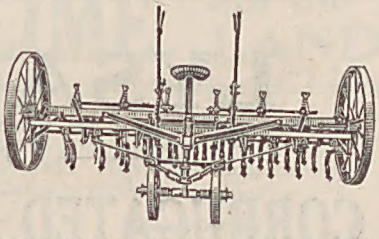

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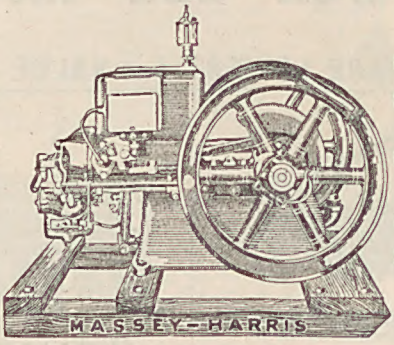

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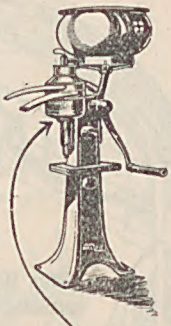

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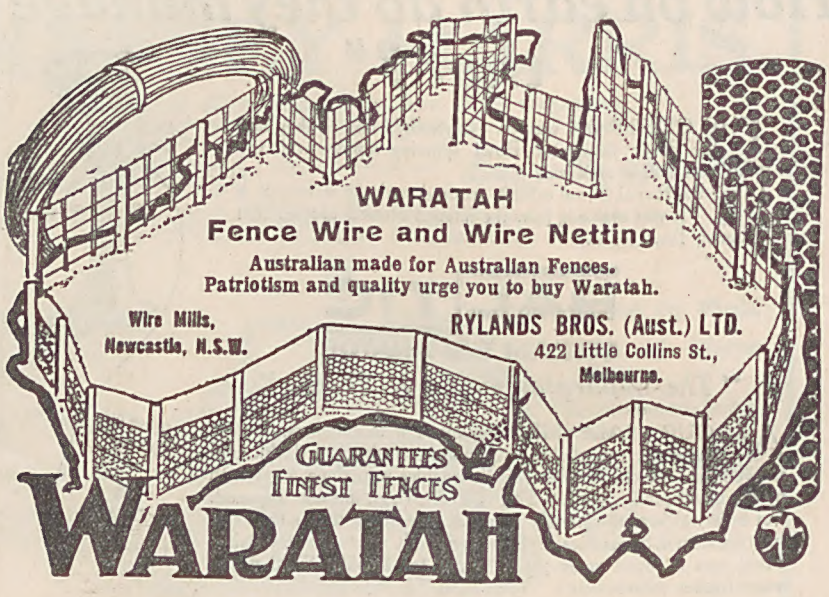

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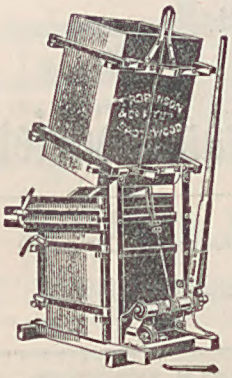

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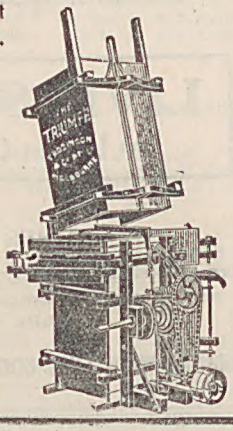

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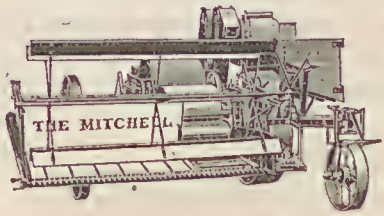

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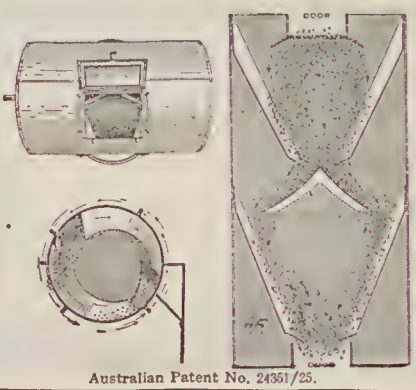

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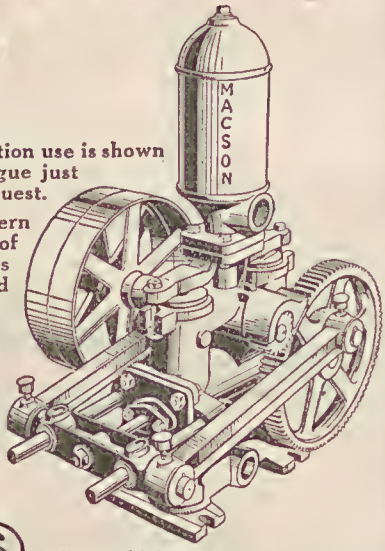

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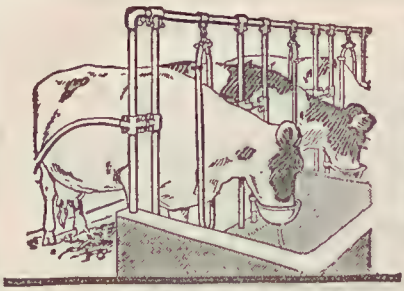

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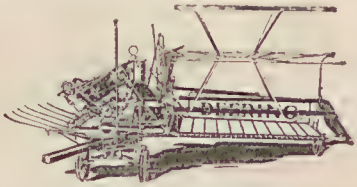

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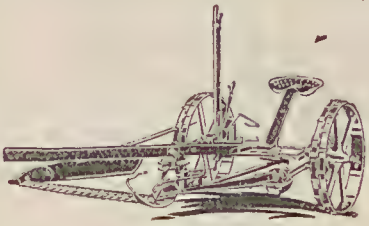

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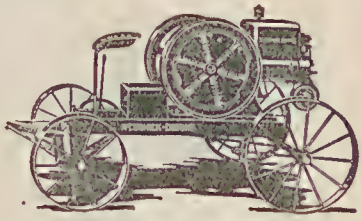

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THE JOURNAL

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OF

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CO-OPERATIVE FREEZING FOR EXPORT.

An Address by Dr. S. S. Cameron, Director of Agriculture, broadcast by 3LO.

About a fortnight ago* I was aboard the "Reso" train on its tour through the Midland districts of the State, the Mallee area and the Murray Valley in the Mildura neighbourhood, and before I proceed to deliver my special message to those interested in lamb and mutton raising on the new co-operative effort in the marketing of fat lambs overseas, let me say that a tour with the "Reso" train is a privilege and a wonderful inspiration. It enables 60 or 70 city-men and country-men to commingle in a visit to parts of the State they have never been in before, and to see in comfort, as the guests of the local people at the various stopping places, the progress that is being made in farming and in country industries. And it enables the seeing and understanding of a range of country in five or six days which could not be seen, let alone understood, in three weeks or a month if ordinary means of travel had to be depended on. And the catering! not exceeded in excellence by any hotel in Australia. And the obliging and ever-at-hand staff of officers and attendants! and the good-fellowship on the train! and the welcome spirit and hospitality shown by the local people, not forgetting the delightful brevity of the speeches! and the interludes of school-boyish fun and the Resonian war-whoop!—all these combine to make a trip on the "Reso" train a really memorable experience even to much-travelled men.

Well, to get on to my job, on this last tour I was asked at least a score of times to explain what was being done in regard to the co-operative effort for the marketing of meat overseas? What was happening to the meat companies which had such a bad spin last year? What was the basis of the amalgamation that they had heard about? What were the prospects, and generally for information about the new scheme? So I concluded that many others interested in lamb and mutton production throughout the State would wish to know what the position is, and I

* The address was delivered on 4th August, 1926.

decided on my return to enlist the good offices of 3LO and "tell the world," so to speak, what has been done and what we hope to do. As an interlude, just here I'll say that for a start the new Amalgamated Company has paid the debts of the companies, or rather we have paid the great bulk of them, and are paying the rest as fast as necessary formalities will allow.

That's not only a good start for the new company, but also a good statement for the start of my address, and, having made it, you will therefore, perhaps, have patience to allow me to discuss for a moment the history of the meat export trade, and particularly the genesis of co-operative export.

Years ago the business of exporting meat was undertaken entirely by a small number of proprietary companies—about three or four—and it is interesting to know that all of the many companies that have from time to time engaged in the trade, including those which have developed into big concerns, made their initial attempts by utilizing the facilitiies offered for freezing and storing at the Government Cool Stores. The very fact that many of these companies have succeeded in building up a large trade is proof that their operations have been conducted in a business-like way. This means, in other words, that they have been fair and equitable in their dealings with producers, and have thus, throughout, commanded confidence.

Please allow me another interlude, so that I may take this opportunity of saying something which I think I ought to say in view of the fact that as the Government representative on the Board and as chairman of directors of the new amalgamated company I am to have a much closer connexion with the co-operative companies than I have previously had, and in that position I will necessarily have to promote, as far as possible, successful competition with the proprietary companies.

I want to pay tribute to the proprietary companies for the help and assistance they gave the Government when it became necessary to commandeer the whole of the export surplus of meat for the War Office to ration the troops at the front, and particularly during the stressful days when the German submarines were paralyzing British shipping and the transport of foodstuffs from the Dominions. During that period I sought the help of private exporters, and the Department of Agriculture was in almost daily contact with the proprietary firms' representatives. We had to work together. We gave them our complete confidence, and the Government of the day was very thankful for the assistance and guidance that was so freely given, and that was so helpful in pulling through those troublous times, without failing the troops on the one hand, and without allowing a collapse of prices and the consequent consternation to producers on the other.

Nevertheless, there gradually grew up amongst stock-owners a feeling that they would like to be directly interested in the handling and marketing of their own stock. The success of the co-operative butter factories was noted, the advantage to the fruit industry of the establishment of co-operative fruit cool stores and of the co-operative marketing of dried fruits was instanced, and the feeling strengthened that, if co-operative freezing works were established in competition with the private

companies, growers of sheep and lambs would be given a wider choice in the marketing of their stock and would have a protection against slump of prices, and, further, that a commendable spirit of self-reliance and independence would be created in the various producing districts.

The Government, with the object of encouraging this spirit of self-help, introduced legislation, in 1919, in the form of the Primary Products Advances Act, which empowered it to make advances to companies to engage in undertakings relating to the secondary processes necessary to the marketing of the primary products of the farm. With the encouragement thus afforded, representations were made to the Government by stock-owners in different districts of the State in favour of the establishment of meat works in country districts in order that lambs and sheep might be slaughtered near by their pastures, and the wastage and deterioration in quality, which is associated with transport to a central works, be avoided.

The Government met the wishes of stock-owners in this regard by making liberal advances to co-operative companies of farmer shareholders, and three new country freezing works were established at Ballarat, Bendigo, and Donald, and a previously existing one at Murtoa was enlarged.

These companies have been operating for the past five years with the greatest success from the stand-point of the farmers and suppliers of stock, who have enjoyed a period of good prices, and in the main have loyally supported the companies. The companies themselves, however, have not been so successful. Unfortunately for them, as companies, they have distributed much of what should have been provided for the building up of reserves to meet the proverbial rainy day, in the form of higher prices paid to their supporters for stock, and so it came about that when the inevitable reaction to the boom price period occurred, the companies found themselves in the position of having to apply to the Government for further financial assistance. During the early part of this year the four companies approached the Government for financial assistance, of which they stood in need on account of losses which each of the companies, in common with all exporting firms, had suffered during the 1925 export season.

These losses had been most largely sustained on account of the slump in prices on the London market which followed on the British coal strike. The slump occurred between the time of purchase on the hoof and the arrival of the carcasses in London, shipments having been delayed through the strike. During the early purchasing period prices were on a 10d. and 10½d. per lb. London parity, while actual realizations were in some cases as low as 7½d. per lb. The Government had already given bank guarantees, in respect of which there was a large total sum which had to be met.

The Government gave the position the fullest consideration, and, in refusing to render further assistance on the basis requested, felt that there was very urgent necessity for the companies concerned to act in better unison than had been the case in the past—to cut out unhealthy competition between themselves, with its consequent forcing up of buying prices to an unjustifiable level, and to cease the overlapping of operations and the invasion of each others' natural territory.

To bring this about, conferences were held between representatives of the companies and the Government, and ultimately it was decided, with the concurrence of the Government, to effect an amalgamation of the interests of the four companies concerned and to form one strong company, responsible to the Government, and through which the Government would be justified in giving all the financial help necessary to re-establish success.

The scheme of amalgamation ultimately adopted was based on the advice of authorities skilled in company merging, and it provided for the formation of a new company, called the Amalgamated Freezing Works Company (Victoria) Limited, in which the four merging companies have taken shares proportionate to the amount of their issued capital. Thus, in the central company, the Bendigo company holds 108 shares, the Ballarat company 79 shares, the Donald company 74 shares, and the Murtoa company 69 shares. Each company is represented on the directorate of the central company by one director, Mr. Eagle, representing Bendigo; Mr. Leishman, Ballarat; Mr. Grewar, Donald; and Mr. Hutchings, Murtoa. The Board of Directors is completed by a Government representative (Dr. Cameron, Director of Agriculture), who is chairman, and a managing director, Mr. N. W. Kingdon.

The central company will, by virtue of an agreement entered into between the central company and the four shareholding companies, take over the business of these companies and operate such works as it is decided require to be operated each season. The staffs of the shareholding companies will act in every respect under the direction of the central company, through its managing director; but the shareholders in all of the original companies will retain their identity as such, and are just as interested in the affairs of the new company as in those of the old companies, and on the success of the working of the plant of each of the old companies will depend the success of the whole. Only one thing is now necessary to secure success, namely, the hearty and loyal co-operation of the stock-owner. I think, from what I have said, it will be readily conceded that, not only at the initiation of the co-operative movement, but now, when troublous times have overtaken the companies, that the Government has done, and is doing, its share towards helping the lamb-raiser; and it would be little short of ingratitude if the support of these producers is not as whole-heartedly given. On the ground of self-interest alone, the primary producers will scarcely be so blind to their own interests as to let slip this further opportunity to continue to have voice in the handling of the marketing of their own product.

In this connexion, I want to say something that I think will give producers the assurance that the marketing from now on will be in highly-skilled hands. Throughout negotiations for the amalgamation of the companies it was realized that, in addition to the safeguarding of the interests of the Government by representation on the Board of Directors, the success or otherwise of the amalgamation would most largely depend on capable management of the affairs of the merged companies; consequently, it was a matter of gratification to the Government when the negotiations which were put in hand resulted in the appointment of Mr. N. W. Kingdon as managing director.

Mr. Kingdon has relinquished the position he held as manager of the New South Wales Meat Industries Board, which administers the whole of the meat supply of the Sydney metropolis. Prior to taking that position he was for four years manager of the Bendigo Co-operative Company, and is consequently familiar with the affairs of the co-operative companies generally as to their methods of operation and the weaknesses which require to be remedied.

Mr. Kingdon has had a lifelong experience in the meat export business, and has held highly-responsible positions in some of the largest firms operating in Australia and New Zealand; and the Government is satisfied that under his capable and experienced management the amalgamated co-operative companies will enter on a period of prosperity that will mean much to the stock-raisers of the State.

Mr. Kingdon entered on his new duties at the beginning of the month (August), and is immediately giving attention to the organizing of his purchasing campaign for the fast-oncoming season.

FRESH MEAT IMPORTATIONS TO GREAT BRITAIN FROM EUROPE FORBIDDEN.

As a result of the discovery of foot-and-mouth disease in hog carcasses from the Netherlands intended for consumption in Great Britain, the British Ministry of Agriculture and Fisheries has prohibited the landing in Great Britain of all carcasses from continental European countries. This order covers carcasses of cattle and sheep as well as hogs, and also fresh and refrigerated meat of such animals, but does not cover fully-cured bacon and ham or rendered fat, cooked or preserved meat or meat essences, or hides and skins which have been dry or wet salted. Imports from Ireland, the Channel Islands, and the Isle of Man are not affected by the order.

This order, if the quarantine continues for any length of time, is of far-reaching significance, not only for the meat trade of the United Kingdom and the Netherlands, but for that of all northern and western Europe and the United States. The large supplies of fresh pork which have been moving from the Netherlands to the British markets will have to seek other markets or be shipped as cured meat, and Great Britain will be obliged to look elsewhere for its supplies of fresh pork. In 1925 out of a total British importation of 139,000,000 pounds of fresh and frozen pork, 92,000,000 pounds were from the Netherlands, 20,000,000 pounds from the Irish Free State, and 14,500,000 pounds from the United States. Of the total of pork supplies in the London Central Markets in 1925, nearly 70 per cent. was from the Netherlands. Beef and mutton supplies from the Continent of Europe are of minor significance on British markets.

This is the first time that the British Government has prohibited the importation of any kind of fresh meat on account of foot-and-mouth disease, although for several years there has been a strict quarantine against live animals from countries in which the disease was known to exist.

IMPROVEMENT OF SOIL TEXTURE.

USES OF GYPSUM.

An address by H. A. Mullett, B.Ag.Sc., Superintendent of Agriculture, broadcast through 3LO.

There is no direction in which the results of scientific investigations have been of more material service to the man on the land than that of the manuring of crops with artificial fertilizers. And there is no more romantic story in the brief history of Australian agriculture than that surrounding the introduction of superphosphate from Europe 25 or 30 years ago, when the persistent advocacy of its advantages by a few enthusiastics, despite scepticism, ultimately led to its general adoption as a practical means of increasing the yields of crops. To-day the miracle of that half a hundredweight of superphosphate an acre works on, say, a wheat crop no longer excites interest. Yet it is no less wonderful than it was, and ever bears witness to the extent to which soil improvement can proceed when tackled in a scientific manner.

An acre of soil, 9 inches deep, weighs, roughly, 2,500,000 lb. Spread 56 lb. weight of superphosphate on that acre, and it will be so sparsely scattered that the pellets will be hard to find. Indeed, many people sprinkle salt much more thickly than that rate on a plate of cold meat! Yet the result of the homeopathic dose is startingly apparent in the young crop; it shoots ahead, ultimately matures earlier, and yields much heavier. It is not difficult to compute the increased yields which accrue as a direct result of applications of superphosphate. Figures published by the South Australian Department of Agriculture set down the mean increase there, due to applications at the rate of ½ cwt. an acre, at 22.1 per cent. In Victoria the corresponding figure is 48.3 per cent. Averaging these two figures it would not be making too great an assumption to put the average increase for Australia at 33 per cent. Thus, a crop which yields 15 bushels without manure is increased to 20 bushels an acre. That is to say, a 5-bushel increase, weighing 300 lb., is obtained in return for 56 lb. of manure, of which, in fact, only a small proportion is actually utilized by the plant.

And what does the use of superphosphate return in money to the wheat-growers? The total annual production of wheat for the Commonwealth is approximately 120,000,000 bushels. Roughly 75 per cent. of this is manured; 33 per cent. of this total is 23,000,000 bushels, and that gain in yield can be ascribed directly to the use of superphosphate. Valued at 5s. a bushel on the farm, this increase is worth £5,750,000 sterling annually. Against this there must be offset the cost of the manure. Assuming that the average dressing used is 56 lb. an acre—it is rather more than this—and valuing the manure at £5 10s. a ton, the cost is in round figures £1,000,000. That leaves on the national balance-sheet a net annual profit of about £4,750,000 sterling, to which must be added several millions more accruing from the manuring of other crops such as oats, barley, potatoes, and last, but not least, from pasture top-dressing.

And what has been achieved with superphosphate can be paralleled in other directions. That is the lesson we must learn.

The marked success attained in Australia in supplementing the plant food of the soil has resulted in little or no attention being paid to scientific improvement of the physical condition of the soil. Yet this latter is a most important field, in which there are possibilities of improvement of crop yields just as wonderful as those which have resulted from the use of manures.

There are great tracts throughout the Commonwealth where the limiting factor to increased yields is the texture of the soil. Often the sub-soil is sufficiently impervious to hold up the winter rains and waterlog the surface; and there are areas where the surface contains so much clay that it runs together and cakes. The latter condition is by no means confined to the moister regions. Much of the land in the wheat belt suffers from this disability. In this latter territory, the maintenance of well-worked fallows is essential for heavy wheat yields. But each summer-rain cements the surface of the paddocks over, if the soil is at all finely divided, as it should be for effective moisture conservation. The loss of moisture proceeds at an increased rate from the "set" fallow, so that its last condition is worse than the first. Once the paddock has set down it cannot be worked except with heavy disc cultivators, which tend to chop the soil more finely still. In that condition there is always a danger that a poor germination will result. If heavy rain falls before the young crop gets through to the light, the surface soil may run together and crust on drying. The seedlings find it difficult to penetrate this, and may perish; indeed, in bad cases, the seed may fail to germinate. The soil packs so closely that air is excluded, and soon fungus growths make their appearance, feeding on the malt generated in the partly-sprouted grain.

During the past five years the Department of Agriculture of this State has made a careful investigation of the texture problem, and as a result has discovered that it is possible to bring about considerable improvement in the texture of certain soils in the Victorian wheat belt, notably in the Wimmera, by applications of gypsum (or copi), large deposits of which occur naturally in the north of the State, particularly in the Mallee.

Applications of gypsum have already begun on a number of farms in the Wimmera, where there is little doubt that it is a commercially profitable practice. Tests have now been commenced in the Goulburn Valley to determine whether a payable improvement in yield results there too.

The tests were initiated at Goroke, in the Western Wimmera, in 1920. There the surface soil is a light cementy silt, overlying a dense clay layer about 2 feet thick. The rainfall, 20 inches, cannot penetrate the clay quickly enough, and tends to waterlog the surface soil. In patches this becomes so wet that horses break through the crust, penetrating to the depth of their fetlocks. Any fallow land must be very judiciously cultivated, or it is reduced to a condition resembling thick soup. Needless to say, soil of this class is regarded as more adapted for grazing than for cultivation, though it will grow one or two fair crops of wheat or oats, but must then be spelled, or a total failure may result.

An area of light land on the Mortat Estate, near Goroke, was fallowed in 1920, and laid out in a series of four ¼-acre blocks, on one of which gypsum was broadcast at the rate of 30 cwt. an acre just prior to seeding. The object of applying the gypsum was to coagulate the

clay particles in the subsoil, and hence to facilitate drainage. It was expected that an increased crop would be harvested, but nobody was prepared to see the crop-yield raised from 16.3 bushels per acre (the yield from the plot given 1 cwt. of superphosphate) to 27.4 bushels an acre, the yield from the land to which, in addition to 1 cwt. of superphosphate, 30 cwt. of gypsum was applied.

The test was repeated the following year on an adjoining block of land, and was confirmatory in every way. Subsequently additional tests were laid down in this district, notably on the farm of Mr. John Cameron, with the result that everywhere, except on the richer banks, gypsum effected substantial improvement in the yields of both wheat and oats. So far as this particular belt is concerned, it is somewhat difficult to determine the exact value of the residual effect of an application of gypsum, because the land must be spelled in grass after a couple of cereal crops have been taken off it. But it has been demonstrated that gypsum applied with the cereal crops benefits the grass that follows them.

This district has been also shown to respond to an unusual degree to dressings of superphosphate, both for cereals and pasture. Subterranean clover does well also, so that the farmers there are particularly fortunate in having several directions in which they can very profitably increase their returns. No doubt they will try the least expensive first.

The success of the tests at Goroke led to a test being laid down on the farm of Mr. Walter E. Dahlenburg, of Salisbury, near Nhill. In this district, as elsewhere in the Wimmera, there are patches of stiff red clay, which are difficult to cultivate satisfactorily. In the hope of improving the texture of such a paddock on the farm, an application of gypsum at the rate of 1 ton an acre was made. A month or so after the gypsum was applied the plot was examined, and found to be much more friable than the untreated land alongside. The difference in the texture of the soil was such that it was possible at harvest time to dig the gypsum-treated land easily with a fork, while the cemented, untreated land could not be dug satisfactorily at all. The crop on the treated land was taller, more regular, and it matured later and was heavier.

Further tests were made on other parts of this farm, and all have been satisfactory. On the occasions of the farmers' field days, hundreds of farmers from the surrounding districts have been able to witness the transformation which has been effected in improving the texture of this stiff clay soil by applications of gypsum.

Much still remains to be done in determining the areas upon which gypsum gives a profitable response. But it has been clearly demonstrated that an application remains effective in the soil for a number of years—at least five or six, and very probably longer. Hence its use is not a recurrent charge, as is the case with superphosphate. Thus the original cost can be distributed over a series of years, cutting it down to an annual charge at least one-fifth the original cost of the gypsum. Gypsum should not be used to replace superphosphate but to supplement it.

First class gypsum deposits have been opened up throughout the Wimmera and the Mallee. It is possible to buy it in bulk in truck

lots at railway sidings in both districts at prices not exceeding 12s. 6d. a ton; hence it can be landed on most farms in the Wimmera for less than £1 a ton.

The reason why gypsum appeals to the Wimmera wheat-grower is because his land has reached prices round about £20 to £25 an acre, and even higher. A block at Horsham was recently sold for £30. The red patches, as they stand now, are worth only from £5 to £8 an acre. Mixed through the black land they are a nuisance. The black land demands plenty of cultivation and late sowing. The red land requires a minimum of working and early sowing. To treat the red patches is to have them work in with the black; both soils can then be worked to better advantage, with all-round increases in yields.

To effect a substantial improvement in texture in the red soil patches, from 1 ton to 30 cwt. of gypsum is required on an acre. The material, which is merely dug out of the soil, sieved and bagged, is best placed on the land with a lime spreader. These machines can be obtained fitted with a lever to shut off the flow at will on the black soil banks which abound in some of the paddocks. To make a test, of course, it will be satisfactory to spread the gypsum out of the back of a dray.

Gypsum should be applied to the surface of the fallowed land in the early spring. It should not be ploughed under, as then it will have little effect on the surface for some time. The earlier it is placed on the fallow after this has been worked down the better, because the fallow will not then cement over, and hence will conserve more moisture—an important consideration in the Wimmera. When rain falls on land which has been treated with gypsum, it will be observed that the water remaining in puddles, in hoof-prints, and the like, no longer becomes turbid with fine clay particles, so that when these dry the usual surface skin is not left behind. This is the explanation of the reason surface setting is prevented.

To sum up, a most promising means of improving the texture of clay soils in the wheat belt has been discovered. It is already a commercial proposition for the treatment of red patches on Wimmera farms. East of the Wimmera no exhaustive tests have been concluded, so that it is impossible to say yet whether gypsum will prove useful there too.

Besides increasing wheat returns, gypsum has been shown to effect useful improvement in the lucerne yields. In tests made at the State Research Farm, Werribee, the average improvment due to the use of 30 cwt. of gypsum an acre is about 10 per. cent. The extent to which it can be profitably used for lucerne depends, as with wheat, on the landed cost at the farm. Where that can be done for less than 25s. an acre, with either crop it is likely to prove profitable.

Apart from the districts enumerated, a considerable proportion of the land in the moister districts of the State is cold and wet during the winter. Although no tests have been made, it would seem that gypsum cannot be expected to effect substantial improvement in freeing this land of so much surplus water. The only remedy there is an expensive one, and that is drainage. While the expense of tiles must necessarily limit that method to high-priced land, much can be done by a well conceived scheme of surface drains, and attention to ploughing methods.

PROFITABLE SHEEP FARMING.

A TALK ON HOW TO BUILD UP A FLOCK.

By N. H. Bowman, Sheep and Wool Expert, broadcast by 3LO.

Up to within the last twenty years the pastoral industry was much more profitable than it is at the present time, for the reason that formerly rents, taxes, and labour costs were much lighter than they are now. In those years little science was required and not half the judgment that is necessary to-day, and one did not need to be so particular as now regarding the type of the sheep he raised. But all this has changed, and it behoves every one engaging in the industry to give serious consideration to the varied circumstances required to obtain the best results.

There was a time when most pastoralists could afford to select the breed of sheep that pleased their fancy, and make it pay, but at the present day the gratification of such a desire would in many cases spell ruination, and, indeed, it has done so in a very great number of cases.

For one to succeed in the growing of wool he must first of all consider the climate as well as the pastures of his particular district. In Australia, owing to its varying conditions, the matter deserves far greater study than it usually receives, as some types and breeds of sheep will thrive and give satisfactory results where others will degenerate both in carcass and wool. Take, for instance, the fine-woolled merino sheep. Place them on the open and exposed plains and their fleeces will gradually become very thin and delicate. On the other hand, a strong merino, whose more robust nature and type is better suited to resist the adverse conditions, will develop into a large, healthy sheep, its fleece, comparatively speaking, uninjured by the hot, dusty climatic influences. To further illustrate the effect climate has on the production of wool, we need only consider the great failure of the Spanish merino sheep when they were introduced into England. The climate did its work most effectually, and the merino failed, but other breeds prospered.

It is often said that climate and pasture play the most important part is determining the type, many contending that any class of sheep changed from one district to another will soon commence to show the same characteristics as those of sheep which have been on the country for years. This idea, to a very great extent, can be taken for granted, but, of course, some judgment must be used in not selecting extreme types. One could not expect the robust merino type to assume the characteristics of the Western District type if run on the same country.

Experience in the past few years has taught much. By strict observation, various districts have been proved to be specially favorable to certain breeds, hence we find many of the old flocks replaced by a more suitable breed.

Sheep, more than most other animals, are most susceptible to improvement. From time immemorial signs of marked changes have been noted in the sheep, and gradually its unshapely body has become one of symmetrical proportions, whilst the hairy covering has changed into a kind of soft fibre of improved structure and texture.

To be successful in a general way, it is not at all necessary to commence with the highest class of sheep, but one should endeavour to start with a useful lot, large framed and well covered with wool. Under ordinary conditions it will never pay to raise sheep for wool alone; the size of the carcass must also be taken into account, and then when the wool-producing properties of a flock begin to fail and give unsatisfactory results, there is something to sell to the butcher.

The First Essential in a Flock—Good Ewes.

Finding the right type, keeping to it, and, if possible, improving it is far better than changing and shifting about. Every district has its type, and with careful culling and classing, however faulty a flock may be, it can be vastly improved, both in covering and formation.

There is a great tendency amongst sheep-breeders to give the greatest consideration to the rams, but the foremost duty of a breeder should be to become the possessor of suitable ewes, for without them the best-bred rams cannot reasonably be expected to give the best results. A man ought to consider his ewes first, and then select his ram with the view of improving the progeny in either symmetry or covering, or both. There being an ever-increasing number of small station-holders possessing a few hundred ewes, which are acclimatized and suited to the district, very useful flocks are being formed by carefully selecting the largest and best formed ewes. They may not be everything desirable in their wool-yielding properties, but having a good, sound constitution and frame, there is something to work upon, and with an ordinary amount of care and judgment a good flock will soon be built up. It is not wise to spend a big sum on the purchase of a single ram—the amount would be better invested in buying a few animals adapted for building up purposes. Gradually the flock can be improved by carefully selecting the best of the younger ewes, the rejects being got rid of in the usual way; thus every season the flock is improved.

Classing and Culling.

What I mean by the term Classing and Culling is—dividing the good ones from the bad ones and getting rid of the latter. Now it may be quite possible that some of you may say, "I have bought a good line of ewes and have sires that are equally as good; therefore all the progeny must be good ones." Well, now, that is a wrong idea altogether. The sheep of to-day have been evolved from very different animals indeed. Originally sheep had not the size of carcass nor the quantity or quality of wool of the modern animal. Unfortunately, the sheep of to-day tends to "throw back" to that of yesterday. No matter how carefully any flock may be bred, you will always get a number of the offspring reverting to the sheep of the non-paying type. Under these conditions classing—separating the good from the bad—becomes necessary. No one can make a definite rule for classing and culling. You must carry out this important work according to the conditions which present themselves, but there are fundamental principles that should be followed in every case. The sole aim of a sheep-breeder is profit, and this must be derived from the carcass and covering of the animal. Therefore, one can give

this advice—breed for the largest frame possible for your district, and, at the same time, have that frame covering packed with wool, but as well as density you must have length and character.

Length, of course, refers to the staple, and for those who do not know what the staple is, let me explain. First of all a fleece of wool is the covering of a sheep, and this fleece is composed of natural tufts or bundles of wool held together by binders. These tufts or bundles are called staples. The character is denoted by Crimp, and the crimp is the undulations or waves seen on the wool fibre or staples. Any fleece with an even or pronounced crimp from butt to tip, showing plenty of character, is termed a well-bred one. A wool devoid of these waves or crimp is known as a badly-bred one. Therefore, breeders should always try to raise sheep that will give wool nicely crimped from butt to tip. There is one more consideration. Besides being nicely crimped it should be even in type and quality, and by evenness in type and quality I mean that the wool produced on the britch portion should not vary to any extent from that on the shoulder and rib. You may ask—"How am I going to tell if there is any difference?" This can be easily done, providing your wool is showing good character. If it is evenly crimped from butt to tip you can tell approximately the quality by the number of crimps to the inch. The more crimps to the inch, the finer the wool. Therefore, if you notice any marked difference in quality between wool grown on the shoulder and that produced on the britch, the fleece is not even in quality.

The necessity for evenness should be borne in mind when a ram is being purchased. There are bound to be faults in type and quality in the wool of many ewes in a flock, and in order to minimize the defect in the progeny a sire as near faultless in this respect as possible should be obtained.

The time for classing depends on circumstances, but, generally speaking, this important work is carried out some weeks before shearing. That it pays to class and keep on classing has been proved time and again.

How to know a Good Sheep.

To class successfully it is imperative to be fully conversant with the fundamental principles underlying what is meant by constitution. First, last, and always, the essential requirement in a sheep is constitution, and constitution is indicated by the animal being strong and robust-looking, with body long and level on the top, good depth at girth, well sprung rib, wide and deep at the chest, legs well set apart and the body set fair and square on them. A sheep having these points will almost certainly be a "good doer," having plenty of room inside the trunk for the internal organs, with little tendency to disease, and when a sheep is healthy it is capable of rearing a healthy lamb and producing a healthy type of wool and plenty of it.

Size is often a point overlooked. On no account should this be lost sight of, as there must be good breeding room as well as good feeding room. For merino sheep, one should aim at big, well-shaped, evenly-covered animals, free from body wrinkles, and any trace of kemp or hair, and at the same time well woolled down to all points. The same

generally applies to fine Comeback sheep. For Crossbreds, one should aim at a large-framed, robust type, covered with a good class of wool, and in all cases the skin of the animal should be a nice cherry-red colour. The mouth should be frequently examined, and, if failing, the ewe should be culled. As a rule, when a ewe is becoming aged, her wool-producing properties begin to fail, as the food she consumes tends to produce fat on her body. Then the wool gets a starved appearance, so to speak, and yields a light fleece.

The whole secret of breeding up a flock to an even, uniform type, is to keep on classing and culling, as far as possible, all sheep not conforming to that type. In order to do this one must have an ideal in his mind, and aim to attain it. When this is accomplished the breeder's next move is to keep this standard of perfection. I do not intend to discuss this matter any further, as my remarks are for, or rather mainly for, the smaller man who is desirous of improving his methods of breeding. The station-holder generally understands his business from A to Z. All culled sheep should be ear-marked so as to avoid the chance of mistake later on.

The Essentials in a Ram.

Having discussed Classing and Culling, there is another very important factor to be considered by the sheep-owner, and that is the selection of rams. It would be a waste of time culling ewes, if later the classed flock was joined with a mongrel ram. All effort would be undone by such a mating. I do not intend at this juncture to go into the individual characteristics of each breed. At some future date I shall try to tell you of them. Just now I shall describe the essentials to look for in a ram.

The first consideration in the selection of a sire is to be assured that he is pure bred—that is, chosen from a pure-bred flock. The reason for insisting that a ram must be pure bred is that a nondescript or mongrel animal will not transmit his characteristics to his progeny.

Secondly, he must possess a good constitution; that is, have a good digestion, and no tendency to disease, which, as I told you earlier, is indicated by length of frame, a well sprung rib, and depth at the shoulder and girth.

Thirdly, he must possess a bold masculine appearance. Generally the head is a valuable indicator of the type. A ram with a good, bold look about him gives one the idea he is fit to be the guardian of the flock.

Fourthly, he must be covered with a wool which is even in quality, and shows correct character.

Fifthly, he must be free from any trace of hair or kemp on any part of the fleece.

These points apply generally to all breeds of sheep. I would urge you not to forget that quantity as well as quality counts. Take, for instance, an open fleece competition. A exhibits a very nice, showy merino fleece of beautiful quality, weighing 5 lb., which, at 32d. per lb., is worth 13s. 4d. B exhibits a Lincoln fleece, weighing 28 lb., which, at 7d. per lb., is worth 16s. 4d. This is just an illustration to show you not to forget quantity which is denoted by density, providing, of course,

that the flock possesses the necessary size of carcass. Therefore, see that your sheep are going to cut you a good weighty fleece.

The Department of Agriculture strongly advocates the use of pure-bred sires, and also urges anybody requiring rams, no matter what breed, to purchase them from registered flock-owners, so as to be absolutely assured that they are pure. The Department is also anxious to help and advise any one in selecting pure-bred rams.

If a farmer or small sheep-owner is considering purchasing a line of ewes, he should try to get them as even in type as possible, so that their progeny will be fairly even in character, providing, of course, pure-bred rams have been used in the mating. With sheep even in type, the making of the wool into too many lines during shearing is avoided. If you can place on the market big lines of wool that are uniform in type, a bigger monetary return is assured.

NATIVE INSECT PESTS OF THE ORCHARD AND GARDEN.

(Continued from page 483.)

By C. French, Jr., Entomologist, and
G. T. Levick, B.Ag.Sc., Science Field Officer.

7. The Cherry Borer Moth. *Cryptophasia (Maroga) unipunctata.*

The larva of the Cherry Borer Moth is, as its vernacular name implies, one of the wood-boring insects, and in its native state bored generally in the Banksia, or native honeysuckle. At the present time few Banksia trees along the shores of Port Phillip can be found without at least one of these borers at work in the branches.

However, the Cherry Borer is known to the orchardist chiefly on account of the havoc it frequently works among his stone-fruit trees—cherries, plums, peaches, and apricots being particularly susceptible to attack by it. Loganberries have also been recorded as host plants.

Life History.

The eggs, which are small and of a slate-grey colour, are laid in clusters on the bark of the host tree, and as the female moth covers them closely with hairs from her abdomen, they are not easily seen, and even when observed are not often recognized as the eggs of a moth.

The larvæ at first bore some distance just under the surface of the bark, but later bore deep into the wood. Where smaller branches are attacked they are completely hollowed out. The sawdust-like material which collects about the entrance to the tunnels is usually quite sufficient to indicate the presence of the borer. The larva is a cream-coloured grub with a darker thorax and brown head, and grows to about an inch and a half in length. Its body is sparsely covered with hairs, and down each side there is a row of small spots.

The moth is fairly large, being about two and a half inches across the wings, which are of a silky white colour. The fore wings have a

single black spot on each; the hind wings are a shade darker than the fore wings. The body is fairly thick-set; the thorax is similar in colour to the fore wings, and the abdomen is clothed with black hairs.

Control.

When the egg clusters can be found, they should be destroyed. If the trees are attacked, the tunnels may be easily located by removing the sawdust-like excrescence, and a stout wire probed down the borings will often kill the grub. If this operation be too tedious, a little bisulphide of carbon, either poured down the tunnel or placed on a piece of cotton wool and forced into the boring, can be relied on to kill the grubs. The entrance to the tunnel should be blocked with soap or clay to prevent the fumes from dissipating. A plug of cotton wool soaked in carbolic acid is also effective.

8. The Vine Moth. *Phalenoides (Agarista) glycine.*

Before the introduction of vines to Victoria, the larvæ of this moth fed on the twining Glycine (from which it takes its specific name) and the Smilax, or Australian sarsaparilla. It is now chiefly known as a pest of the grape vine, and in private gardens the Virginia creepers and fuchsias are often almost defoliated by the attacks of the caterpillars, while the buds of apple trees have also been attacked.

Life History.

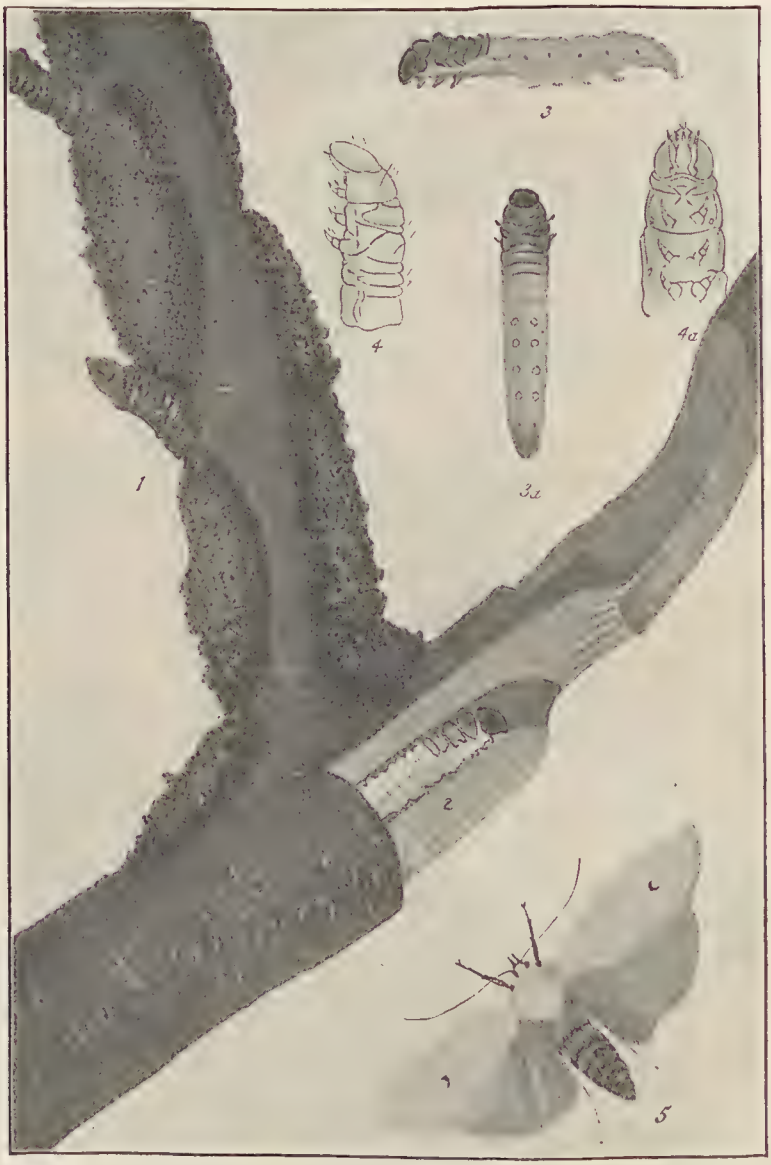
The rather strikingly-coloured day-flying moth is a very frequent visitor to our gardens in the spring and summer months. The moth measures about two inches across the outstretched wings, which are of a black-colour with two rather conspicuous yellow blotches on each fore wing. The body is also black, with a fringe of bright red on the tip of the abdomen. The vine moth is rather slow and heavy in its flight, and is often captured by children, who almost invariably call it a butterfly, probably on account of its rather striking colours and its day-flying habits.

The eggs are laid on the leaves and stem of the food-plants; during warm weather they hatch in a few days to dark greenish-black caterpillars. These little caterpillars are exceptionally voracious, and rapidly work havoc with the foliage of the vine. The greatest damage is done, however, when the grapes are forming, for the caterpillars will eat whole bunches of the flowers and the young grapes. As they grow, the green, yellow, and black stripes give them a rather handsome appearance. The larvæ; on becoming full-grown, lower themselves to the earth by a thread, and pupate. It is in this state that the later broods pass the winter.

Control.

Arsenate of lead spray has proved very efficient in getting rid of this pest, and in gardens a persistent campaign of hand-picking is often quite successful. Thorough working of the soil round vines will destroy many chrysalids.

Of the natural enemies, birds and the "Vine Caterpillar Bug" (*Oechalia schellembergi*) are the most useful.



[From French's Handbook of the Destructive Insects of Victoria.]

Plate VI.—Cherry Borer. (*Cryptophasia* (*Maroga*) *unipunctata.*)

Fig. 1.—Cherry branch attacked by borers, appearance of sawdust-like covering indicating the grub at work.
Fig. 2.—Larva in bore, where it retires when not feeding.
Fig. 3.—Larva (or grub); top view. Natural size.
Fig. 3A.—Larva (or grub); under view. Natural size.
Fig. 4.—Head and first three segments of larva. Side view.
Fig. 4A.—Head and first three segments of larva; ventral view.
Fig. 5.—Perfect insect. Natural size.

[From French's Handbook of the Destructive Insects of Victoria.]

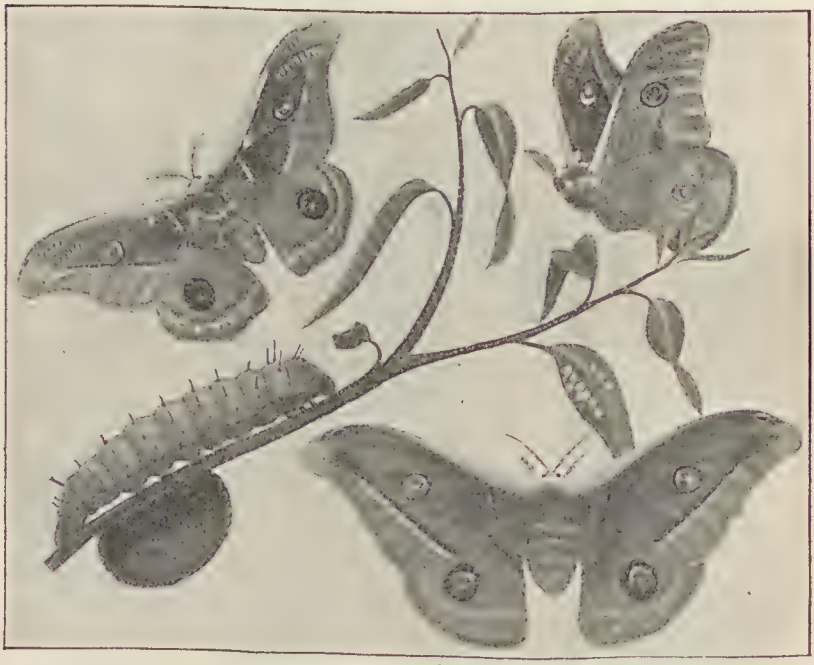
Fig. VII.—The Vine Moth. (*Phalenoides* (*Agarista*) *glycine.*)

The illustration shows caterpillar on leaf and stem, perfect insects on wing and one at rest, and pupa (all natural size).

9. The Gum Emperor Moth. *Antheraea eucalypti.*

This fine moth is the commonest Australian representative of the family of silk-worm moths. The large, brightly-coloured caterpillar feeds on eucalypts, but since the introduction of the pepper tree has found the aromatic leaves of this tree equally to its liking, and has become a rather serious pest, this giant amongst caterpillars being able to devour an immense amount of foliage in a surprisingly short time.

The Emperor Gum Moth larva has been recorded as attacking the foliage and fruit spurs of apple trees, and on several occasions it has been found infesting roses. However, while it does not seem likely that it will become a serious pest of orchard trees, the damage done to eucalypts planted for shelter or ornament, and to the very useful pepper tree, warrants its inclusion here.



[From French's Handbook of the Destructive Insects of Victoria.]

Fig. VIII.—The Gum Emperor Moth. (*Antheraea eucalypti.*)

The two moths shown in the upper portion of the illustration are males, that in the lower is a female. The larva and cocoon are shown on the branch (left-hand side).

Life History.

It is one of the largest and most handsome of the Victorian moths. The female measures over five inches across the wings, the male being rather smaller. In colour, the moth varies somewhat from buff to almost a brick-red. In the centre of each wing is an eye-spot, rather more conspicuous in the hind wing, while a narrow dark band runs parallel to the hinder margins of both wings.

The eggs, which are fairly large and conspicuous, are yellowish-white in colour and spherical in shape. They are laid in rows on the food plant, though occasionally a moth which has lost its bearings will lay them on almost anything, sometimes with rather quaint results. On one occasion a row of these eggs was found by a householder, and he immediately concluded that the timber borer was endeavouring to enter the timber work of his house.

The eggs hatch to tiny brownish-black grubs, which, as they grow, become remarkably handsome green caterpillars, ornamented with numerous fleshy tubercles, tipped with clusters of blue and red spines.

The larvæ attain a length of up to four inches, and on becoming full-grown pupate within a tough brown silken cocoon, from which the moth emerges in due course.

Control.

Spraying with arsenate of lead is a suitable remedy, and also, when the trees are small, hand-picking may be resorted to.

There are numerous insect parasites, mostly belonging to the Hymenoptera, the wasp family, and failure of the larva to reach the moth stage is frequently due to the depredations of these parasites.

(*To be continued.*)

A SERIOUS EPIDEMIC IN YOUNG CHICKS.

By H. A. Woodruff, M.R.C.V.S., M.R.C.S., &c., Professor of Veterinary Pathology, University of Melbourne.

A very serious matter for the poultry farmer is a recent outbreak of "Bacillary White Diarrhœa" among chicks from three to four days old.

This disease is prevalent in many parts of the world, and not infrequently occurs in Victoria. In the outbreak which came under my notice recently, the owner lost over 80 per cent. of his chicks last year, and was losing this year's hatch at the same rate when the disease was diagnosed.

Bacillary White Diarrhœa attacks chicks within the first four or five days after hatching; birds older than this are rarely affected. The disease is caused by a microbe or germ called *Bacillus pullorum*. This is in many cases present in the egg, and, therefore, the chick is born with the infection. These pass on the disease by means of their droppings, so that other chicks, healthy when hatched, can pick up the infection whilst only a day or so old.

Symptoms.

The only characteristic feature is the persistent white diarrhœa and the dullness of the affected chicks, the great majority of which die within a day or two. A few may recover, and, though they may grow into good strong birds, unfortunately they rarely get rid of the infection. Usually they retain some of the causal microbes in their ovaries,

and, when the birds produce eggs, those eggs contain the microbe. If the eggs be fertile, the chicks from them will be infected. Thus it happens that the few chicks saved from the original epidemic are, in fact, much more of a danger than of use. It would be far better if 100 per cent. died, for with thorough disinfection of incubator, brooders, &c., the epidemic would be at an end. The chicks saved nearly always carry on the disease infection to the next year.

In the outbreak recently investigated, the owner is a capable hard-working man, with quite a good equipment. Last year his breeding stock, which had been bought in, looked healthy, and everything went well till the chicks began to arrive. Within one or two days after hatching they showed signs of diarrhœa, and were dropping about until they died in large numbers.

When the disease petered out the whole plant was thoroughly disinfected, but, since the owner did not suspect any disease in his breeding stock, *he kept these birds for breeding again this year.* This year the trouble made its appearance as soon as chicks began to hatch out, and the same high percentage of losses occurred. It was at this stage that the Veterinary Research Institute was consulted.

Result of Investigation.

A number of the affected chicks and a number of eggs at various stages of incubation were sent to the Institute. On bacteriological examination, both eggs and chicks were found to be infected with the microbe, *Bacillus pullorum,* the cause of bacillary white diarrhœa. Cultures of the microbe were grown from both eggs and chicks.

Having determined the nature of the disease, the next point was to ascertain how many of the breeding stock (about 90 in all) were affected and were producing infected eggs. For this purpose it was necessary to make a blood test from each bird. The necessary amount of blood was procured by making a small incision across the wing vein and receiving about ¼ oz. (a dessert spoonful) into a dry sterile bottle. This was sent to the laboratory, and here the test was performed.

The Agglutination Test.—This test consists in mixing a little of the blood from a suspected fowl with a fluid suspension of the *Bacillus pullorum* in a broth culture. This broth culture is simply a specially prepared beef tea in which has been sown the microbe. The broth is slightly turbid or murky when the microbe is growing well, and if a small drop of it be placed under the microscope the germs can be seen evenly distributed and floating about quite freely.

When a minute quantity of blood from a hen affected with this disease is added to the broth culture on the slide under the microscope, a change is soon seen. The microbes now begin to clump or group together, because they find in the blood of an affected bird a substance they do not like—a substance which has been formed in the body as a defence or antidote against the disease. It is as though a dog be sent into a paddock in which sheep are scattered about quite happy and unconcerned, but when the dog appears they all flock together for safety. So the microbes clump or agglutinate when they are subjected to blood or blood serum from an affected hen, whereas the blood of the normal hen leaves them quite unconcerned and evenly distributed over the microscopic field.

By this test, applied to 88 hens and 8 roosters, it was discovered that 1 rooster and 49 hens were infected. Every one of the pens had infected birds in it.

Control.

After discovering the extent of the infection, the question at once arose—what action should be taken? There were two possible lines of procedure. The first was to kill off the affected birds and start again with the remainder which the test had shown to be healthy, buying in more birds if necessary. But just here two warnings must be given. It would have been very unwise to have started again without any further tests of the apparently healthy birds. Every infectious disease has an incubation period, that is to say, there is an interval of some days between the time of infection and the time when symptoms begin to show. Thus it is always possible that birds tested to-day and found "not infected" may be in this incubation period, and if they be tested again in a week or so they will give a positive reaction. Therefore, it is necessary, after testing a flock of birds and separating off the affected ones, to put the non-affected in thoroughly clean disinfected pens. They must be kept isolated and tested again in a fortnight's time. If they all prove clean on this second test, they may with confidence be used for breeding. The other warning is that, having bought infected birds in the first instance, one may buy them again, and it is advisable to keep these new birds in isolation until they too, have been tested. If they are proved by the test to be healthy, they may be let loose with the rest of the flock, and be used for breeding.

The alternative procedure was to retain the affected birds for egg laying, but not for breeding. At the end of the season they could be fattened and sent to market. This would have minimized the loss, but it might possibly have kept the infection on the premises. There is always a considerable risk of further outbreaks whenever young susceptible chickens are being hatched out. To avoid this, all the birds proved to be infected by the blood test must be got rid of at the end of the season. They should not be sold to any one who may attempt to use them for egg production or breeding, but only for the table, for which purpose they are perfectly fit.

A thorough disinfection of the whole equipment must follow the clearing out of infected birds, especially incubators, brooders, and all utensils and premises used for young chicks. Fumigation of closed-in buildings with formalin vapour,* and the thorough washing down of all fixtures with a strong creolin solution, followed by lime-washing of walls, is to be advised.

Following the disinfection, it is a good plan to leave the pens open to sunlight and air for as long an interval as possible before putting in new birds. When the breeding season commences, the risk of a serious spread of infection is considerably lessened by having numerous separate

* The method of generating formalin vapour is as follows :—

For each 1,000 cubic feet of space, the following is required—

Formalin	1 lb.
Condy's crystals	½ lb.

The crystals should be placed in a bucket, and set in the incubator or rooms to be disinfected. All openings are then closed up carefully and the formalin is poured on the crystals. No time should be lost in leaving the rooms, &c., and quickly shutting the doors, because a brisk effervescence occurs during which the disinfecting gas is given off.

The mixture should be placed in a bucket or other vessel sufficient to hold at least twelve times the amount of mixture actually used, because the frothing mixture otherwise may spill over the edges of the vessel.

pens, with only a small number of birds in each. If an infectious disease breaks out, it may be discovered whilst still present in only one pen, and by immediately getting rid of the birds in that pen, that is, of all the birds which have been in contact with the diseased ones, the spread of infection will be stopped, and the disease die out.

Finally, a word of advice to those breeders who are unfortunate enough to have a heavy mortality in young chicks. Do not neglect to try to find out the cause of the trouble in the early stages, and, if possible, get advice on how to deal with it. By so doing, one will not only be helping himself, but most likely will be preventing the spread of the disease through whole districts.

EXPERIMENTS IN POTATO CULTIVATION, 1925-26.

Results at Millbrook, Trentham, and Childers.

By J. T. Ramsay, Potato Expert.

The results of the experiments carried out by this Department at these three places are herewith presented.

As at Korumburra and Catani (the results from which were published in this *Journal* for June, 1926), a uniform scheme of manure tests was applied.

At Millbrook, tests additional to the manures were carried out, these being—

Immature versus ripe seed trial.
Selected versus unselected seed trial.
Varietal tests.
Cultivation tests.

The weather conditions during the growing period at all of these centres was dry—exceptionally so from about the middle of January until March—with the result that crops as a whole were light.

In spite of this fact, the crops responded to the various manurial treatments in a manner which supported findings of previous years. In this report little more will be done than to present the results of the past season, but in a future article details of the average performance of the various manurings, in the various classes of soil, under the varying seasonal conditions, will be given. In the season 1923-24 it was decided to adopt a uniform programme of manuring for the whole of the potato experimental plots. The object of this was that after a series of years a true average performance of different manurings could be obtained.

The greater the number from which an average is taken, the more reliable and valuable the average will be.

The results of this past season again show that on the red volcanic soils in the central highlands of Victoria only light dressings of manure (chiefly phosphatic) are necessary to produce the best returns, while the Gippsland areas, with heavier rainfalls, respond best to what might

be termed fairly heavy dressings of compound manures. This will be seen from the tables submitted hereunder:—

Results of Potato Experiments at Millbrook, 1925-26.

Plot.	Manure per acre.	Market Sized Tubers.	Increase from Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per acre.	Net Increase.
		T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	Limed Portion.						
1	3 cwt. super.	4 3 0	1 13 0	0 18 9	0 11 4	16 10 0	15 11 3
2	6 cwt. super.	4 3 0	1 13 0	1 17 6	1 2 9	16 10 0	14 12 6
3	9 cwt. super.	3 15 0	1 5 0	2 16 3	2 5 0	12 10 0	9 13 9
4	6 cwt. super., 1 cwt. pot. sulph.	3 12 2	1 2 2	2 13 0	2 7 0	11 5 0	8 12 0
5	No manure	2 10 0	.. ..	.. ..	.. ..	.. ..	.. ..
6	6 cwt. super., 1 cwt. amm. sulph.	3 18 0	1 8 0	2 15 0	2 0 0	14 0 0	11 5 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph. ..	3 18 0	1 8 0	3 10 6	2 10 0	14 0 0	10 9 6
8	3 cwt. market garden ..	3 10 0	1 0 0	1 8 6	1 8 6	10 0 0	8 11 6
9	3 cwt. basic phosphate ..	3 12 2	1 2 2	0 18 9	0 10 0	11 5 0	10 6 3
	Unlimed Portion.						
1	3 cwt. super.	4 13 1	2 3 1	0 18 9	0 8 11	21 12 6	20 13 9
2	6 cwt. super.	4 3 0	1 13 0	1 17 6	1 2 9	16 10 0	14 12 6
3	9 cwt. super.	3 18 0	1 8 0	2 16 3	2 0 0	14 0 0	11 3 9
4	6 cwt. super., 1 cwt. pot. sulph.	4 0 2	1 10 2	2 13 0	1 16 0	15 5 0	12 12 0
5	No manure	2 10 0	.. ..	.. ..	.. ..	.. ..	.. ..
6	6 cwt. super., 1 cwt. amm. sulph.	4 5 2	1 15 2	2 15 0	1 11 0	17 15 0	15 0 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph. ..	4 5 2	1 15 2	3 10 6	2 0 0	17 15 0	13 4 6
8	3 cwt. market garden ..	4 13 1	2 3 1	1 8 6	0 13 4	21 12 6	20 4 0
9	3 cwt. basic phosphate ..	3 18 0	1 8 0	0 18 9	0 13 4	14 0 0	13 1 3

A comparison of the average return from liming at the rate of one ton per acre of ground agricultural lime as against no lime is given. The class of country is rich red volcanic loam:—

Result of Lime Trials on Potatoes at Millbrook, 1925-26.

(Average of 9 plots each.)

Limed (1 ton per acre).	Not Limed.	Average Depression of Yield due to Liming.
T. c. q.	T. c. q.	T. c. q.
3 13 2	4 0 3	0 7 1

In this class of country, as in previous years, the application of lime actually produced an average depression in the yield. Only in two instances (plots 2 and 5) did the liming equal the unlimed portion, and in no instance did liming increase the yield at Millbrook. Immature seed again proved its superiority over ripe seed. The increase in favour of immature seed, while in actual tonnage per acre not being as heavy as in other years, owing to the lighter crops, nevertheless, averaged over 20 per cent. In all of these tables the increase in values per acre from the various treatments is shown in terms of £ s. d., in order to practically demonstrate the improved returns obtainable from improved methods. This should appeal to growers who are in the business of potato growing for what they can make out of it. Values are calculated this season at £10 per ton, which is really below the average cur-

rent price for the season. Only market-sized tubers are taken into consideration in these computations:—

Results of Immature v. Ripe Seed Trials, Millbrook, 1925-26.

Variety.	Immature.	Ripe.	Increase from Immature Seed.	Value of inc. at £10 per ton.
	T. c. q.	T. c. q.	T. c. q.	£ s. d.
Carman I. ..	4 8 0	3 10 0	0 18 0=20%	9 0 0
Duchess	3 18 0	3 0 0	0 18 0=23%	9 0 0
Minato	5 6 0	4 5 1	1 0 3=19%	10 7 6

The table following, showing the returns from seed selected from heavy-bearing plants (i.e., those producing 7 or over market-size tubers of good type) is interesting—the more so because the selection was made from the crop two years ago—and were subjected to no selection last year. This selected seed was planted alongside seed which was taken from the run of the same variety. It is coincidental and interesting that while the average increase in favour of selected in the case of five varieties similarly tested the previous season was 33 per cent., last season's test works out at 34 per cent. increase:—

Selected Seed v. Unselected, Millbrook, 1925-26.

——	Market Size.	Small.	Total.	% of Small to Large.
	T. c. q.	T. c. q.	T. c. q.	
Carman III. (selected) ..	5 14 0	0 7 2	6 1 2	6·5%
Carman III. (unselected) ..	4 5 0=34%	0 12 2	4 17 2	14·7%
Difference in favour of selection	+1 9 0	−0 5 0	+1 3 0	..

Increased value per acre (at £10 per ton) in favour of the selected seed (market size) is, therefore, £14 10s. per acre.

There has been some doubt in the minds of growers with regard to the advisability or otherwise of intercultivating the crop during very dry-soil conditions. Many contended that this would do more harm than good. Last season, with its excessive dryness, gave an excellent opportunity of determining this. Sections of the paddock on which the experiments were carried out were subjected to one, two, and three horse hoeings respectively between the rows of the growing crop during the dry spell, with the result shown in the table hereunder:—

Result of Cultivation Test at Millbrook, 1925-26.

Variety, Carmen III.; manure, 3 cwt. super. per acre.

——	Large.	Small.	Total.
	T. c. q.	T. c. q.	T. c. q.
One cultivation after planting	3 12 2	0 15 0	4 7 2
Two cultivations after planting	4 5 1	0 10 0	4 15 1
Three cultivations after planting	5 14 0	0 7 2	6 1 2

These figures show a marked improvement in yield for each extra cultivation, and, while it is hardly fair to take as absolute the return of one trial, I feel convinced that subsequent tests will only confirm this result. In seasons of ample moisture, horse-hoeing at frequent intervals aids the growth materially by keeping weeds in check and by improving the aeration of the soils.

The following is the result of the trial of varieties:—

VARIETY TRIALS, MILLBROOK, 1925-26.

Manured with 3 cwt. super. per acre.

Variety.	Large.	Small.	Total.
	T. c. q.	T. c. q.	T. c. q.
Carman No. 3	5 14 0	0 7 2	6 1 2
Minato	5 6 0	0 10 0	5 16 0
Manhattan	4 18 1	0 17 2	5 15 3
Brownell's Beauty	4 0 0	1 10 0	5 10 0
Sussex	4 0 0	3 5 0	7 5 0
Earliest of All	4 10 0	0 12 2	5 2 0
Brown's River	3 18 0	1 2 2	5 0 2
Carman I.	4 8 0	0 10 0	4 18 0
Wellington	3 18 0	0 17 2	4 15 2
Duchess	3 18 0	0 15 0	4 13 0
Beauty of Hebron	3 0 0	0 15 0	3 15 0
Maul's Thoro'bred	2 15 0	0 15 0	3 10 0
Red Ohio	2 15 0	0 12 2	3 7 2
Excelsior	2 10 0	0 10 0	3 0 0

RESULTS OF MANURE TRIALS AT TRENTHAM EAST, 1925-26.

Plot.	Manure per acre.	Market Sized Tubers.	Increase from Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per acre.	Net Increase Value per Acre.
		T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	LIMED PORTION.						
1	3 cwt. super.	5 0 0	2 5 0	0 18 9	0 8 4	22 10 0	21 11 3
2	6 cwt. super.	4 10 0	1 15 0	1 17 6	1 0 1	17 10 0	15 12 6
3	9 cwt. super.	4 0 0	1 5 0	2 16 3	2 5 0	12 10 0	9 13 9
4	6 cwt. super., 1 cwt. pot. sulph.	4 5 0	1 10 0	2 13 0	1 15 4	15 0 0	12 7 0
5	No manure	2 15 0	..	..	..	..	..
6	6 cwt. super., 1 cwt. amm. sulph.	5 10 0	2 15 0	2 15 0	1 0 0	27 10 0	24 15 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph. ..	5 0 0	2 5 0	3 10 6	1 10 4	22 10 0	18 19 6
8	3 cwt. market garden ..	5 5 0	2 10 0	1 8 6	0 11 5	25 0 0	23 11 6
9	3 cwt. basic super. ..	4 10 0	1 15 0	0 18 9	0 10 8	27 10 0	..
	UNLIMED PORTION.						
1	3 cwt. super.	4 15 0	2 5 0	0 18 9	0 8 4	22 10 0	21 11 3
2	6 cwt. super.	4 15 0	2 5 0	1 17 6	0 16 8	22 10 0	20 12 6
3	9 cwt. super.	4 10 0	2 0 0	2 16 3	1 8 1	20 0 0	17 3 9
4	6 cwt. super., 1 cwt. pot. sulph.	4 15 0	2 5 0	2 13 0	1 3 7	22 10 0	19 17 0
5	No manure	2 10 0	..	..	..	..	..
6	6 cwt. super., 1 cwt. amm. sulph.	6 5 0	3 15 0	2 15 0	0 15 0	37 10 0	34 15 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph. ..	5 15 0	3 5 0	3 10 6	1 2 6	32 10 0	28 19 6
8	3 cwt. market garden ..	5 10 0	3 0 0	1 8 6	0 9 6	30 0 0	28 11 6
9	3 cwt. basic super. ..	5 5 0	2 15 0	0 18 9	0 6 10	27 10 0	26 11 3

The soil on this plot is similar to Millbrook, and responds in like manner to manures. It also shows a depression in yield when lime is applied.

The Childers district, in Gippsland, is one of those parts of Victoria which responds well to heavy manuring, as will be seen from tables, which show very great increases in weight and money value per acre from liberal manuring.

Without manure, however, it yields very poorly, as is shown clearly by the yields of both the limed and unlimed sections, to which no manure was applied. Judging from the results of the past and other years, it almost seems a waste of time and labour to crop this country without the application of fertilizer.

In both the limed and unlimed portions a remarkable increase is shown in sections 6 and 7, where ammonium sulphate with super. and a complete fertilizer were applied.

A noticeable feature also is the low cost of manure per ton per acre increase, ranging from the low figure of 3s. 1d. in the case of 3 cwt. basic super. with lime to 17s. 10d. per ton in the case of 9 cwt. super. without lime, although this is still a moderate figure. But for the low weights of the no-manure plots, the average yield per acre from all-manured would be very high for so dry a season as last.

RESULTS OF MANURE TRIALS AT CHILDERS, 1925-26.

Plot.	Manure per acre.	Market Sized Tubers.	Increase from Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per acre.	Net Increase per Acre.
		T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	LIMED PORTION.						
1	3 cwt. super.	5 3 2	3 18 2	0 18 9	0 4 10	39 5 0	38 6 3
2	6 cwt. super.	5 3 2	3 18 2	1 17 6	0 9 8	39 5 0	37 7 6
3	9 cwt. super.	5 8 3	4 3 3	2 16 3	0 13 3	41 17 6	39 1 3
4	6 cwt. super., 1 cwt. pot. sulph.	5 3 2	3 18 2	2 13 0	0 13 4	39 5 0	36 12 0
5	No manure	1 5 0	..	..	..	..	..
6	6 cwt. super., 1 cwt. amm. sulph.	7 5 0	6 0 0	2 15 0	0 9 2	60 0 0	57 5 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph.	8 5 3	7 0 3	3 10 6	0 10 0	70 7 6	66 17 0
8	3 cwt. market garden	5 10 0	4 5 0	1 8 6	0 6 8	42 10 0	40 1 6
9	3 cwt. basic super.	7 5 0	6 0 0	0 18 9	0 3 1	60 0 0	59 1 3
	UNLIMED PORTION.						
1	3 cwt. super.	4 13 0	3 3 0	0 18 9	0 6 0	31 10 0	30 11 3
2	6 cwt. super.	5 8 3	3 18 3	1 17 6	0 11 0	39 7 6	37 10 0
3	9 cwt. super.	4 13 0	3 3 0	2 16 3	0 17 10	31 10 0	28 13 9
4	6 cwt. super., 1 cwt. pot. sulph.	4 18 1	3 8 1	2 13 0	0 16 0	34 2 6	31 9 6
5	No manure	1 10 0	..	..	..	..	..
6	6 cwt. super., 1 cwt. amm. sulph.	6 5 2	4 15 2	2 15 0	0 11 5	47 15 0	45 0 0
7	6 cwt. super., 1 cwt. pot. sulph., 1 cwt. amm. sulph.	5 10 3	4 0 3	3 10 6	0 17 6	40 7 6	36 17 0
8	3 cwt. market garden	4 13 0	3 3 0	1 8 6	0 9 0	31 10 0	29 1 6
9	3 cwt. basic super.	4 13 0	3 3 0	0 18 9	0 6 0	31 10 0	30 11 3

This class of country is one of the few in Victoria which seems to be materially influenced for the better by liming, as is shown by the following table:—

Liming Results at Childers, 1925-26.

Rate, 1 ton per acre.

Average of nine plots each.

	T.	c.	q.	
Limed	5	12	1	per acre.
Unlimed	4	13	3	„ „
Increase from lime..	0	18	2	„ „

Considerable increase in the programme of experimental and demonstrational work in potato cultural methods is proposed for the coming season, and an outline of the complete scheme for all plots is given herewith.

PROGRAM OF EXPERIMENTAL WORK FOR 1926-27.

Tests to be Conducted on Millbrook Potato Experimental Plots.

Eight variations of manure tests, together with check plots, all to be in duplicate.
Change of seed tests—Milbrook seed against Gippsland Swamp seed from Catani.
Variety tests.
Immature versus ripe seed tests.
Selected versus unselected seed tests.
Seed dipped in formaline against untreated seed, for control of diseases.
Seed treated with dry copper carbonate against untreated seed, for control of diseases.
Green manuring against fallow, without artificial manure.
Green manuring against fallow, with artificial manuring.
Seed whole and cut, dipped in 5 per cent. solution of nitrate of soda, against seed untreated, for influence on crop.
Seed whole and cut, dipped in 10 per cent. solution of nitrate of soda, against seed untreated, for influence on crop.
Cut versus whole seed tests.
Time of cutting seed tests—Three weeks before planting; two weeks before planting; one week before planting; and same day.
Spacing test—12 inches, 16 inches, 20 inches between sets, in 27-in. rows.
Spacing test—12 inches, 16 inches, 20 inches between sets, in 30-in. rows.
Copper sulphate powder at the rate of 1 cwt. to the acre, against none, for control of disease.
Cultivation test—1, 2, 3, and 4 horse hoeings, for influence on crops.

Results of each of these tests are to be taken in quadruplicate, i.e., in duplicate from each duplication.

Tests to be Conducted on Farmers' Plots with Potatoes.

E. Cleversley, Catani (peat swamp).
E. Brodie, Fern Hill (red volcanic loam).
W. H. C. Holmes, Korumburra (grey clay loam).
E. Bull, Musk Creek (light loam).
J. Gooch, Wheatsheaf (heavy volcanic loam).
F. Mayo, Childers (chocolate loam).
Spring Bros., Romsey (red volcanic loam).
S. Adkins, Warragul (grey loam).

Eight variations of manure plots, together with check plots, on an area of 2 acres—all to be in duplicate.
Cut versus whole seed.
Spacing test—12 inches, 16 inches, and 20 inches between sets, in 27-in. rows.
Spacing test—12 inches, 16 inches, and 20 inches between sets, in 30-in. rows.
Cultivation test—1, 2, and 3 horse hoeings, for influence on crop.
Change of seed test (at Catani only)—Millbrook against Catani seed.

Ten individual rows of farmers' plots to be harvested, and the weights kept separate. If necessary, this to be taken from the farmers' own crops.

THE PIG INDUSTRY.

(Continued from page 574.)

By R. T. Archer, Senior Dairy Inspector, and A. J. Gill, Senior Herd Tester.

Vitamines in Relation to Feeding Pigs.

In discussing the question of pig feeding, the essentials are described as protein, carbohydrates and fat, and mineral constituents must not be forgotten. Within comparatively recent years it has been discovered that food for animals, just as for man, must contain other elements, which have been given the name of vitamines. The nature and the chemical composition of vitamines are not yet fully understood, but they are known to exist in varying minute quantities in different foods. Small as the quantity is, it is absolutely indispensable for the growth and health of the young animal. Should these elements be removed from the natural food, it will fail to support nutrition, and actual disease may result. This may be prevented and the animal restored to health by replacing what has been removed, or by adding it from other sources.

Vitamines are contained in plants, whence they become available for flesh-eating animals, and pass into their tissues. They were discovered by scientists investigating the disease known as beri-beri among the people of the East, who were fed chiefly on rice. This disease, which is a form of paralysis, became prevalent after the introduction of milling machinery from the West. The process of polishing removes part of the outer coating of the rice containing the germ in which the vitamines are stored. When fed on this polished rice, the people developed beri-beri, and when some of the material removed in the process was returned, they quickly recovered.

At the present time there are three known vitamines, and all are necessary for health and growth. There are, besides, two others, of which little has been determined; one of them, however, is known to have a marked influence on reproduction. The three known vitamines have been named Fat Soluble A, Water Soluble B, and Water Soluble C., or antiscorbutic.

The first, as its name implies, accompanies the fat portion of the extracts of cells and tissues; it is necessary for growth, and it is believed to be the substance that prevents the disease of rickets. It is found most abundantly in milk, eggs, cod liver oil, and green leaves (especially legumes).

The second, known as Water Soluble B, is the substance which is a a protection against neuritis, and if absent in the food beri-beri results. It is found in yeast, in grains and in cereals.

The third is Water Soluble C, or antiscorbutic, and is the vitamine that prevents scurvy.

It has been found that for a while young animals will continue to grow when the Fat Soluble vitamine is deficient in or absent altogether from their diet. The explanation of this is probably that the animal normally contains reserve supplies of this vitamine in its body, and is able to draw upon them when a deficiency occurs in the diet; but, as soon as this reserve is exhausted, growth and nutrition are

immediately stopped. This is extremely important, and cannot be too much stressed. It has been found that when pigs are not weaned until they are three months old they have stored up sufficient vitamines from the sow's milk to carry them on for at least three months; whereas, if they are weaned at from six to eight weeks, they have only sufficient reserves to last them for a month or so, and after this period early weaned pigs soon go downhill unless food rich in vitamines be supplied to them. Some very large pork producers do not wean their pigs before they are three months old.

A very interesting point generally overlooked is that the milk of cows fed on a good green pasture is much richer in vitamines than that from stall-fed cows; likewise, the milk of a sow grazing on good clover is richer in vitamines than that of the sty-fed sow.

Another important point is that animals fed a diet deficient in vitamines are extremely prone to all forms of lung disease, in fact, become highly susceptible to any form of bacterial infection.

In the case of the Water Soluble B, the animal does not appear to possess any appreciable reserve upon which to draw in the event of an emergency; consequently the ill-effects of a deficiency are more quickly apparent. Following the absence of this vitamine, there is an immediate cessation of growth by young animals, while in adult animals there is a gradual loss in body weight, with signs of nerve disease and paralysis of their hind legs.

Fat Soluble A is found in green leaves and in the embyro, or germs, of many seeds. Storage of this element is particularly marked in adult animals, and is of considerable importance to the sow when carrying and suckling her young. It is found in butter and in the yolk of eggs, and also in many oils and fats derived from the animal kingdom; but in oils and fat from the vegetable kingdom it is present in very small quantities, if at all. Maize oil appears to be an exception.

The most important source of supply of Fat Soluble A vitamine is pasture. If none is available, feed rich in oil, such as cod liver and other fish oil, should be provided.

Water Soluble B is contained in large quantities in yeast—a by-product of breweries, which is used largly for pigs wherever brewing is carried on extensively. Legumines, i.e., lucerne, clover, peas, beans, &c., are rich in this substance, as are cereals. The milk of animals grazed on good pastures contains a fair quantity of it, hence the value of skim milk as a feed for pigs. From the foregoing, however, it will be seen that if skim milk or whey is not available, these vitamines may be provided from other sources.

Water Soluble C, or anti-scorbutic vitamine, is also essential for the health and development of young animals. Should it be absent, they will not thrive, and will be listless and fall into ill-health, but will improve as soon as food containing the vitamine is supplied. The Water Soluble C vitamine is also found in milk, but boiling the milk will destroy it. Heat also destroys some of the Fat Soluble A vitamine, and this may explain to some extent why cooking the food reduces its feeding value, as has been proved by feeding experiments. Other foods rich in the Water Soluble C factor are tomatoes, turnips, cabbages, and most fruits.

Another vitamine, not yet fully investigated is known to exert a very strong influence on reproduction, and is an aid in overcoming sterility. This vitamine is contained in lettuce and some other green leaves.

The table given below contains a list of foods containing the different vitamines from which choice may be made as circumstances render necessary:—

Table showing the Distribution of the Vitamines A, B, and C in the Common Foodstuffs.

XXXX means very plentiful, XXX abundant, XX relatively large amount, X present in small quantities, O absent, (?) not definitely proved.

—	A.	B.	C.
Milk, whole	XXX	XXX	XX
Milk Powder, whole	XXX	XXX	X(?)
Milk Powder, skim	X	XXX	X(?)
Whey	X	XXX	X
Lucerne, green	XXX	XXX	XXXX
Clover, green	XXX	XXXX	XXXX
Grasses, green	XXX	XXX	XXXX
Yeast, brewers'	O	XXXX	O
Yeast Cakes	O	XX	O
Cod Liver Oil	XXXX	O	O
Maize Oil	XXXX	O	O
Fish Oil	XX	O	O
Coco-nut	XX	XXX	O
Rice, polished	O	O	O
Rice, whole grain	X	XXX	O
Wheat, whole grain	X	XXX	O
Wheat Germ	XX	XXX	O
Wheat Bran	O	X	O
Wheat Middlings	O	XXX	O
Maize Germ	—	XXX	—
Rye	X	XXX	O
Maize, Yellow	X	XXX	(?)
Maize, White	O	XXX	(?)
Oats	X	XXX	O
Barley	X	XXX	(?)
Oats, green sprouted	X	XX	X
Beans	O	XX	O
Peas	X	XX	O
Linseed	XX	XXX	—
Cotton Seed	XX	XXX	—
Millet Seed	XX	XXX	O
Sunflower Seed	X	—	O
Meat Meal	—	—	—
Lean Meat	X	X	X
Beet Root	X	X	XX
Cabbage, fresh	XXX	XXX	XXXX
Cabbage, dried	XXX	XXX	X
Carrots	XXX	XXX	XX
Lettuce	XX	XX	XXXX
Mangels	XX	XX	(?)
Onions	(?)	XXX	XXX
Parsnips	XX	XXX	—
Peas, fresh	X	XX	XXX
Potatoes	O	XXX	XX
Potatoes, sweet	XXX	XX	(?)

TABLE SHOWING THE DISTRIBUTION OF THE VITAMINES A, B, AND C IN THE COMMON FOODSTUFFS—*continued.*

XXXX means very plentiful, XXX abundant, XX relatively large amount, X present in small quantities, O absent, (?) not definitely proved.

—	A.	B.	C.
Swedes	—	XXX	—
Apples	—	XX	XX
Lemons	O	XXX	XXXX
Oranges	—	XXX	XXXX
Pears	—	XX	XX
Raisins	—	X	X
Tomatoes	XX	XXX	XXXX
Olive Oil	O	O	O
Vegetable Oils	O	O	O
Tallow	O	O	O
Lard	O	O	O

PLANTING AND PRUNING FRUIT TREES.

An address by H. W. Davey, Chief Orchard Supervisor, broadcast by 3L.O.

For success in the growing of fruit trees anywhere, plenty of light and air is necessary. Different climatic conditions will suit different trees, but the soil must always contain enough moisture for their requirements, in addition to the essential elements in a state of solubility. These elements are nitrogen, phosphorus, potassium, lime, magnesium, iron and sulphur, and in the absence of any of them in sufficient quantities, trees will not thrive.

The commercial fruit-grower is well aware of the importance of good cultivation, and land for the reception of fruit trees should be thoroughly prepared previous to planting operations being commenced, as trees grow much better when this is done than when they are set out in unweathered soils.

Good cultivation sweetens and aerates the soil, in addition to making more plant food available by the action of air on the soil particles.

Good healthy trees, showing vigorous growth, with good root systems, should be selected. On receiving the trees from the nursery they should be at once unpacked, and all broken or damaged roots pruned. The cuts should always be made on the underside so that the cut surface will face downwards when planted). When the trees come to hand they should be "heeled" in, and if this work is carelessly done, serious harm may result. They should be placed singly in a trench, and, so that they may be kept as dormant as possible, in a sloping position.

A little soil should be well worked in between their roots, after which the remainder should be returned to the trench and firmed by treading.

Laying Out the Orchard.

The laying-out of an orchard is of importance. There are several methods of doing this, such as the hexagon, quincunx, and square system. The latter is now the plan usually adopted as being superior in many ways—some of the most important being the long parallel lines of trees, which make cultivation, spraying, irrigation, harvesting, and other operations easier than is the case where other systems of planting have been followed.

For laying-out the orchard, a planting wire is usually employed. This consists of a wire pulled taut, and marked off with pieces of copper wire soldered along its length at the distances at which it is intended to plant the trees. These marks are usually every 20 feet, thus giving 108 trees to the acre. Sometimes, with large growing trees such as apricots, these spaces are 24 feet apart, giving 75 trees to the acre. It is important that great accuracy be exercised in marking off the planting wire, otherwise the rows of trees will not come in line.

The importance of planting for interpollenating influences is now generally recognized as being one of the most important in orchard practices, some varieties being almost infertile on their own pollen. The planting of single varieties in large blocks is now almost a thing of the past.

Varieties that bloom at or about the same time should be planted adjacent to each other. This has come to be recognized as absolutely necessary with many varieties of plums, pears, apples, almonds, &c. Take for example some of the large blocks of Jonathan apples planted some years ago. These were found to be producing only very light crops; yet, when in these same blocks every second or third row of trees had been top-grafted with a variety flowering at the same time as the Jonathan, heavy crops resulted.

Planting the Orchard.

Planting may be commenced as soon as the leaves have fallen, showing that the trees have become dormant.

In planting, it is important that trees should not be placed deeper in the soil than that formerly occupied by them in the nursery.

Mistakes are frequently made in the mistaken idea that large holes are necessary to give the tree a good start in the orchard. A large hole will not cause any harm in a naturally drained soil, or in land artificially drained by means of agricultural tile drains, but in the case of land having a stiff retentive sub-soil, a large hole merely becomes a receptacle for water to drain into. Thus, for long periods the young trees stands in or over water, and in these conditions it is impossible for it to thrive. It is, therefore, undesirable that holes should be dug any deeper than the cultivation. They should, however, be wide enough to make the disposal of the tree roots an easy matter. It is a great mistake to make the tree fit the hole.

Another frequent cause of failure is the placing of stable manure in the hole in which the tree is to be planted. This does not give the tree a chance at all, as owing to the decay of the mass of organic matter, soil conditions arise that are most uncongenial to fruit trees.

It is a benefit when planting to scatter a couple of handfuls of bonedust at the bottom of the hole; this will assist, instead of retarding the tree, as would be the case if stable manure were applied.

It is frequently noticed when planting a tree that one of its roots is stronger than the others; if this root is much disproportionate in size to the remaining roots, it is better to cut it completely away. But where there is no great disparity it is better to plant the young tree with the strongest root towards the prevailing winds; this assists in bracing the tree and giving the head balance. The remainder of the roots should be spread out evenly, and none should be left curled up or crossed.

When the first lot of soil is being shovelled in at planting, the tree should be slightly bumped up and down a few times, as this causes the soil particles to get well settled among the roots; in addition, it also tends to give the roots the desirable downward direction. As more soil is returned to the hole, it should occasionally be trampled down, so as to make the tree stand firm.

In windy situations it is often necessary to stake the newly-planted trees to prevent them rocking and becoming loose. In such places the supporting stake should be firmly driven in before the tree is planted. This, while preventing risk of injury to the roots, also does away with the use of a planting board.

Pruning Young Trees.

It is better to leave the pruning of the young trees until after planting. The first pruning is of the greatest importance, and many trees are made or marred at this time. Hard cutting should always be the rule when planting and for the following two or three years.

In the first place, the tree on being dug from the nursery row, has, no matter how carefully lifted, suffered a great reduction of its root system, and if planted without having the head reduced so as to bring back a balance between it and the roots, the young tree will be heavily handicapped from the start of its career.

Another phase often overlooked is that in a tree lightly pruned at planting, too many leaves emerge in spring, and these transpire moisture at a greater rate than the mutilated roots only commencing to function can supply—thus debilitating the tree. It is, therefore, advisable when pruning at this stage, to so reduce the head as to make the balance all in favour of the root system.

In pruning a young tree heavily by cutting it hard back, there is the additional advantage that the main leaders will emerge low down instead of commencing high up on the stem of the tree, and it should always be the aim of the fruit-grower to establish a low-headed tree—one built on sturdy lines, so that later on these limbs can carry heavy crops of fruit without supports.

Occasionally, trees received from a nursery have only two leaders; in this case, the weaker, or worst placed one, should be cut completely out, and the one remaining shortened back to three or four strong buds. If such a tree be allowed to retain the two leaders it will be almost certain to split in halves during the first heavy crop it carries, as no matter how large a tree may become ultimately, the strain and weakness will always be where the two leaders divide.

The best number of leaders to start a tree with is three, or at the most four; these should be cut to side buds facing in the right directions, and, as previously stated, low down. This hard cutting causes the growth from these buds to sweep away at a much wider angle than if only light cutting had been practised.

The following pruning season, the young tree should again be cut hard back, so as to cause the secondary leaders to be set low down on the main leaders. The result will be a sturdy tree, with low-set leaders, and capable, later on, of carrying heavy crops of fruit without the necessity of props (which sometimes act as a harbour for codlin grubs) to prevent them from breaking down.

Experiments carried out at the Fruit Farm, Woburn, England, showed that trees which were not pruned until the second year after planting were much debilitated. The leaves produced in the first season's growth were 24 per cent. and the wood 45 per cent. less than on similar trees properly pruned. Over a period of ten years these trees produced only one-third of the quantity of fruit yielded by trees pruned at planting.

When the tree has established twelve or more leaders, pruning will become much lighter than formerly. This should consist more in keeping the tops of the leaders free of competition from strong laterals, regulating fruiting wood by shortening back these, making provision for new fruiting wood, and keeping the head open.

It is better to look upon a tree as an assemblage of individuals rather than as one, for it must be remembered that every part of a tree is competing with another portion of it. If one branch can gain an advantage over another branch, it will do so—to the decided injury of the other. A struggle for position goes on in every part of the tree, even to the smallest twigs.

This competition between several parts of a tree is due to that green-coloured protoplasm known as chlorophyll, which uses the energy of sunlight to fix carbon and elaborate the crude sap sent up by the roots, and if leaves are not exposed to good light, they do not function properly.

If a shoot be better placed than its neighbours, it will rapidly use its position to the disadvantage of others less favorably situated. It is therefore necessary that the person pruning should suppress any dominant shoot by removing it altogether, or at any rate weaken it by changing its direction; this can be done by cutting it back to a lateral, which, firstly, will alter its direction further from the vertical, and secondly, will constrict the bark at the wound made in pruning. The nearer a branch approaches the vertical position the stronger will be its growth, so that any deviation from this position tends to check runaway growth. Horizontally-placed wood is always weaker in growth, owing to slower sap movement, and, therefore, develops fruit-buds.

Common mistakes in pruning fruit-trees are in not cutting sufficiently hard back during the first few years after planting, and then in later years pruning too severely.

A fruiting condition is largely in an inverse ratio to the vegetative activity of the tree. It can be noticed by the least observant of people that where trees have been properly planted and tended under conditions

congenial to them, they will, during the first few years make vigorous growth; this is due to sap activity. On the other hand, trees planted in water-logged or otherwise unsuitable soils, make very little growth, but produce large quantities of fruit buds. This is the result of slow sap movement, and trees in this condition are useless, the leaders practically making no growth at all, and the numerous small and useless fruits produced still further tax the already devitalized trees, and, at last, the disgusted owner pulls them out.

I have occasionally seen in the daily press advertisements of trees that will bear fruit the season following that in which they are planted. Such trees as will do this are useless and are best put on the rubbish heap for burning.

Another common mistake is in allowing too many strong laterals to remain high up on the leaders. Any strong-growing shoots, growing high up on the leader should always be cut away. If such laterals are allowed to remain, the top of the tree will utilize all the sap being sent up by the roots, and as these laterals are competing with each other, a dense head is soon formed, whilst lower down fruit-spurs and fruit-laterals become exhausted owing to the sap passing them to feed the top of the tree, and, further, some of them may be killed altogether owing to their being shaded from above.

A person has only to examine any unpruned tree; it does not signify in the least whether this is a fruit tree or a gum tree; and it will be noticed that it is devoid of live shoots or buds low down on the trunk and branches. The reason is that the unpruned crown can use all the sap supplied by the roots; this, in addition to the shading of the lower parts, results in their starvation.

It is the flow of sap to the top of a tree that gives the unpruned forest trees their long trunks free of limbs lower down, and even if occasionally such trees send out low limbs, these are free of side growths.

In the case of unpruned or too lightly pruned fruit trees, we find most of the fruit at the tops of the leaders, and little or none lower down; whereas, when leaders are kept light, an ample supply of sap is received by the more lowly placed laterals, and what is equally important—sunlight. The result is a retention of fruiting wood low down in the tree where it is most wanted.

Fruit placed low in tree is easy to spray, less liable to sun-scald, easy to pick—and where it should be.

FARMERS' FIELD DAY

AT THE STATE RESEARCH FARM, WERRIBEE.

For several years it has been the custom of the Department of Agriculture to hold, during Show Week, a Field Day at the Research Farm, Werribee, to enable farmers from the four corners of the State to visit the Farm and see the results of some of the various experiments being carried on there. Last year the Director of Agriculture (Dr. Cameron) said that he knew a couple of hours was not nearly enough to enable visitors to get even a glimpse of all that was to be seen, and that in future the Field Day would have to be an all-day function. Accordingly, this year arrangements were made for those who wished "to make

Mr. Mullett, Agricultural Superindent, addressing the farmers on the result of Crop Rotations.

a day of it" to go to Werribee in the morning, and so have time for a more detailed study of the various activities than was possible on previous Field Days.

Some 170 farmers left the city by charabancs on the morning of 24th September, and reached the Farm about 10 o'clock. The visitors were divided into several groups. Those interested in cereals—mostly wheat-growers from the Mallee and the Wimmera—were conducted around some of the experimental plots by Mr. H. A. Mullett (Superintendent of Agriculture). In the course of a brief lecture on fallowing, Mr. Mullett explained how moisture could be conserved in the soil by mulching the surface, and that the depth should not be more than 4 or 5 inches to ensure good germination, gradually lessening in its subsequent workings to half that depth. In the tour of inspection Mr. Mullett was assisted by Mr. Wilson, the Farm Manager, who spoke on the

cropping methods followed at the Farm, and by Mr. George Gordon, cerealist, who interested his audience by describing how new wheat varieties are raised.

The other sections of the party went—as fancy or interest dictated—to see the Farm stock. Mr. R. J. Talbot spoke on horse breeding, and specified the good points to be sought for in a horse. Mr. J. M. Kerr had charge of the party that inspected the Red Poll and Friesian dairy herds, and Mr. J. E. Thomas, Forage Research Officer, lectured on the feeding of stock and the necessity of top-dressing pasture lands. Mr. Bowman, the Sheep and Wool Expert, spoke on phases of sheep rearing, and Mr. W. C. Rugg was in charge of those the object of whose visit was to add to their knowledge of housing and feeding poultry.

In addition to those who attended the morning session, 400 or 500, including a fair sprinkling of ladies, visited the Farm in the afternoon,

A Talk on Dairying by Mr. J. M. Kerr.

most of them going by special train. In the course of a brief welcome, the Minister of Agriculture (Colonel Bourchier) said they were seeing the Research Farm not by any means at its best, but rather under semi-drought conditions. However, this was good from a research point of view, for it would put some theories to the test. Further, if favorable conditions always existed at the Farm, many might be inclined to say, "We could all get satisfactory results if we got good seasons."

Research work, continued Colonel Bourchier, was just as essential in farming as in any other business, and the Department very much appreciated the help that had been given from time to time by agricultural societies. What was wanted to-day was the co-operation of farmers throughout the length and breadth of the land, and though in the past, perhaps, there was not much sympathy with such movements as the

Research Farm represented, that feeling, he thought, had almost ceased to exist to-day.

Mr. Mullett then assumed leadership of the party, and briefly explained the objects and some of the results obtained from the rotation plots. Mr. L. C. Bartels, Irrigation Field Officer, spoke on the growing of lucerne under irrigation, and Mr. Wilson on the treatment of the farm pastures. The experiments being carried on in the eradication of hoary cress were detailed, and the seriousness of the weed was indicated, not only by the manner in which it was growing in spite of efforts made to destroy it, but by a skeleton plant on view, the main root of which was 5 feet in length.

Again the party was split into small groups. Some inspected the manurial trial plots, and others attended lecturettes on horses, dairy cattle, sheep, and poultry.

When afternoon tea had been partaken of, Mr. J. H. McLachlan, President of the Bannerton Better Farming League, in moving a vote of thanks to the Department, said that, as a way-back Mallee farmer, he appreciated very much the privilege of being shown over the Farm, and, judging by the faces of those around him, he thought a feeling of gratitude was general.

The Minister (Colonel Bourchier) in acknowledging the vote of thanks, said that the Government desired to do all it could for the man on the land. They recognized the disabilities of those in the more remote parts of the State, and were anxious to do what they could to better rural conditions. This could be done only by disseminating knowledge through the land. He said Victoria was extremely fortunate in having such an excellent scientific staff in the Department of Agriculture, and he was glad to express his appreciation of them. Some might be inclined to say, "We know as much about agriculture as they." He was inclined to say the same thing himself at one time, but he had learnt a very great deal since his association with the staff of his Department.

The Hon. P. G. Stewart, M.H.R., in moving a vote of thanks to the staff, said—"In our experiments at Carwarp I come into close contact with the officers of the Department, and know the excellent work they are doing for agricultural education. Their hearts are in their work, and they are trying to solve the many problems that confront the agriculturist. Millions of pounds are being lost annually through misdirected efforts on the part of many hard-working farmers. If the average farmer were only as good as the best, most of this loss would be avoided. There has been a steady improvement in recent years through a spread of knowledge and the use of better wheat and better implements; and, if this improvement continues, gradually more land will come under cultivation, and Australia will in time take its place in the forefront of the wheat-growing countries of the world. I have great faith in the future—a faith that is strengthened by my knowledge of the splendid band of officers on the staff of the Department of Agriculture."

Mr. E. J. Hogan, M.L.A., Leader of the State Opposition, in seconding the motion, said that he commended the Government for all that it had done to win knowledge likely to be of use to the farmer and to encourage the application of this knowledge in the wide and varied field of agriculture.

AN INQUIRY INTO VINE GRAFTING.*

By F. de Castella, Government Viticulturist.

In many branches of horticulture grafting is an indispensable operation. In viticulture, more particularly, it is a basic or fundamental operation in those districts where phylloxera has established itself. In these, viticulture is no longer possible unless the vines are grafted on resistant stocks. The whole of Australia must inevitably become phylloxerated, sooner or later, the spread of the insect to areas now clean being merely a matter of time.

The imprudence of planting vineyards with European vines "on their own roots," even in districts which are still clean, is not sufficiently realized. The grafted vineyard is safe from any risk, it yields equal, if not superior, crops, of a quality in no way inferior, whilst its useful life is of amply sufficient duration.

It is obviously essential that it should be properly established. The two chief factors upon which the success of a grafted vineyard depend are adaptation and affinity. The first signifies the proper suiting of the stock to soil and climate; the second may be defined as the harmony existing between stock and scion after grafting.

Adaptation has given little trouble in the reconstitution of Victorian vineyards. The climate and the majority of the soils, in districts where it has been carried out, are admirably suited to the resistant vine.

The affinity existing between stock and scion is of quite equal importance; unless it be satisfactory, success is out of the question. Growth will be defective, and the union at the graft will not be lasting. In cases of less glaring incompatibility, the yield may suffer to a greater or lesser degree.

Why some combinations of stock and scion are satisfactory and others not is difficult to explain; no obvious characteristics permit the forecasting of success or failure. Previous experience of any given combination is the only reliable guide. It is generally admitted that the closer the botanical relationship the greater the affinity. A pear grafted on seedling pear grows better and lasts longer than if grafted on quince stock. It might, therefore, be thought that in grafting Vinifera sorts (European vines) on vines belonging to distinct species of American origin, frequent cases of faulty affinity would be met with. Fortunately, such is rarely the case; the affinity existing between Vinifera sorts and the leading resistant stocks is, with comparatively few exceptions, equal to that when grafting Vinifera on Vinifera.†

Among resistant stocks we have Vinifera × American hybrids, and stocks which are altogether American—either a pure American species or a hybrid between two or more of these.

Greater affinity has not been found between the Vinifera scion and the Vinifera × American than between it and the purely American

* Paper read at the Perth Meeting of the Australasian Association for the Advancement of Science—August, 1926

† In the grafting of Vinifera on Vinifera cases of marked lack of affinity are occasionally met with.

stock. Affinity varies in the most curious way, and apparently not according to any definite rule.

A few examples may be given. Let us, in the first place, consider the two rather closely related stocks known as A.R.G.I. and No. 1202. The breeding of the former is Aramon (Vinifera) pollinated by Vitis Rupestris; that of the latter Mourvedre (Vinifera) pollinated also by V. Rupestris. A.R.G.I. shows all-round affinity in a marked degree; almost any Vinifera scion does well when grafted on it. No. 1202, though a good stock for certain scions, is much more difficult to suit; some European sorts failing altogether on it. Zante Currant and Ohanez are more or less complete failures on No. 1202, yet they thrive on A.R.G.I. The Sultana, on the other hand, does well on both these stocks. Hence we may class the Sultana as a "good scion," or one which thrives on almost all the stocks on which it has been tried; Zante and Ohanez are, on the contrary, "difficult scions." We may also class A.R.G.I. as a good all-round stock, and No. 1202 as a capricious one.

Muscat Gordo Blanco is generally recognized to be a "bad scion," or one which is difficult to suit with a stock.

Some combinations are unsatisfactory owing to the poor fruit yield of the scion when grafted on that particular stock, though growth may be so vigorous as to preclude any idea of faulty affinity—a glaring example of this case is Malbeck grafted on Rupestris du Lot.

It is obviously desirable that a list of such failures should be compiled, with a view to the avoidance of such combinations by those about to establish a vineyard. Rectification of mistakes of this kind is a slow and costly business, entailing, as it does, the eradication and replanting of the vineyard.

Unfortunately, no comprehensive list of the kind has yet been compiled under Australian conditions. A series of experimental affinity plots has been established at the Rutherglen Viticultural Station, where over 400 different combinations of stocks and scions are under observation. These are not yet old enough to warrant definite conclusions, though several interesting facts have already been brought to light.

Meanwhile a big experimental field is presented by the whole of the privately-owned vineyards in north-eastern Victoria, where reconstitution on resistant stocks has now been in progress for 25 years. Much practical experience has been gained, which, if summarized and made available, should prove of value to intending planters.

With this end in view a circular was sent to all Victorian growers supplied with resistant vines from the State vine nurseries, inviting answers to the questionnaire reproduced below. The object of the present paper is to summarize the replies received, and to endeavour to present the information in a useful form.

In the lines which follow the writer has avoided expressing his personal views. The opinions are those of the practical growers who replied to the circular. Only stocks and scions concerning which they have written, are mentioned. This will explain some omissions which may seem strange to readers familiar with the vineyards of north-east Victoria.

Questionnaire.

1. Name and address—
2. Area under vines—
   (*a*) Bearing—
   (*b*) Not bearing—
3. Type of land (state hillside or flat, sand, loam, clay, &c.), and whether irrigated or not—
4. Native timber before land was cleared—
5. Stocks grown. Enumerate in order of area planted—
6. Scion varieties. State stock on which each is grafted—
7. Stock or stocks most generally satisfactory. State with what variety grafted—
8. Unsatisfactory stock or stocks. With what scion grafted? State why unsatisfactory (growth or fruit)—
9. Unsatisfactory combinations (stock and scion, e.g., Tokay on 1202, Malbeck on du Lot). In what way unsatisfactory? Poor growth or poor yield, &c.
10. Influence of stock on yield. Do any stocks increase or reduce yields? State stocks and scions—
11. Drought resistance. Has any stock shown superiority? State scion variety—
12. Of the different combinations (stock and scion) in your vineyard, state which are—
    (*a*) Striking successes—
    (*b*) Satisfactory—
    (*c*) Unsatisfactory—
13. If about to plant again in your locality, what scion varieties would you grow, and on what stocks would you graft them?—
14. Any other remarks likely to interest intending planters—

Circulars were sent to 194 growers. Replies were received from 52 only. The information thus obtained mainly concerns wine-making sorts. Table grapes are not extensively grown in the North-eastern district. Drying grapes have also received little attention. A few replies deal with Gordo Blanco and Sultana, but Zante Currant has not been mentioned in any of the replies.

Soils and Situations.

Questions 1 to 4 cannot conveniently be summarized. The majority of replies were from the Rutherglen and Barnawartha districts, where the soils are mainly loamy and the geological formation is of Silurian age. These soils vary from sandy to stiff, with mellow clay subsoil. Some vineyards are on hillsides, others on flat land. The native timber is chiefly yellow box (*Eucalyptus mellidora*), where the subsoil is loose, and grey box (*Eucalyptus hemiphloia*), on stiffer land. On the sandy soils, Murray pines (*Callitris*) are plentiful. These soils are well supplied with potash, especially in the subsoil, but poor in lime and phosphoric acid. A few replies were received from the Goulburn Valley, where the land is rather similar to the flat land near Rutherglen, though the subsoil is a stiffer clay. A few replies were also received from Mildura, where the soils are of Mallee and Belar types, quite different to the foregoing, and much better supplied with lime.

Most Popular Stocks.

The following were the stocks mentioned, in the order of their frequency, in answers to Question 5. The figures in parentheses indicate the number of times each was mentioned:—

Rupestris du Lot (28).
Riparia × Rupestris No. 3309 (24).
Riparia × Rupestris No. 3306 (24).
A.R.G.I. (Aramon × Rupestris Ganzin No. 1 (22).
No. 1202 (Mourvedre × Rupestris) (20).
No. 420A (Berlandieri × Riparia) (11).
Metallica Cape (Rupestris) (8).
No. 101-14 (Riparia × Rupestris) (4).
No. 106-8 (Riparia × Cordifolia Rupestris) (3).
No. 41B (Chasselas × Berlandieri) (2).
No. 62-66 (Vinifera Rupestris × Cordifolia) (2).
Solonis (2).
Nos. 84-3 (Viniferia × Vinifera Rupestris) (1).
No. 34E (Berlandieri × Riparia) (1).
Riparia Gloire (1).
Riparia Grand Glabre (1).

Scion Varieties.—The scion varieties mentioned are, in the order of their popularity, as follow:—(The name usual in Victoria is, in each case, given first, the true name appearing after this, in parentheses, in cases where the local name is incorrect.) *Wine Sorts.*—Shiraz or Red Hermitage (Syra), White Hermitage (Uni Blanc), Brown Muscat, Rutherglen Tokay (Harslevelu), Rutherglen Pedro (true name unknown), Chasselas, Blue Imperial (Cinsaut), Malbeck, Grenache, Mondeuse, Muscat of Frontignan, Alicante Bouschet, Pedro Ximenes, Riesling, Doradillo, Pinot Blanc (Semillon), Palomino, Calmette, Carignane, Burgundy (Pinot Noir), Merlot, Brachet, Touriga, Blanc Select, Mataro, Durif, Tempranillo, and Montils. *Among Table and Drying Grapes*—Sultana, Gordo Blanco, Waltham Cross (Rosaki), Snow's Muscat, Lisbon or Raisin des Dames (Bicane), Purple Cornichon, Red May, Joannenc, Flame Tokay, St. Jeannet. *Sundry Table Grapes* (unspecified).

Stocks Suitable and Otherwise.—With so many stocks and scions a vast number of combinations is possible. In order to present the information collected in a concise and convenient form, the replies to questions 7, 8, 9, and 12 have been analysed and summarized. Each scion variety is taken in turn, and the stocks on which it has been grafted are listed in the order of their popularity. Opinions concerning success or otherwise are defined by the qualifications "Striking Success," "Satisfactory," and "Unsatisfactory." The numbers in parentheses indicate the number of replies which expressed such opinions. The number of opinions concerning some usual combinations is smaller than one would expect. A good many growers have, in their replies, take up the "nothing special to report" attitude, and have mentioned only one or two of the combinations in their vineyard. Such reticence, no doubt, indirectly indicates the success of the others; if not satisfactory they would be quick to complain.

Shiraz (*Syra*) has been grafted on—

3309..	.. Striking success	(8)	—Satisfactory	(14)	—Unsatisfactory	(nil)
3306..	.. „	(3)	„	(14)	„	(nil)
du Lot	.. „	(1)	„	(10)	„	4
420A	.. „	(1)	„	(4)	„	(nil)
1202..	.. „	(1)	„	(3)	„	(nil)
A.R.G.I.	.. „	(nil)	„	(3)	„	(nil)
Metallica Cape	„	(nil)	„	(3)	„	(1)
101–14	.. „	..	..	..	„	(1)

The most generally suitable stocks for this sort seem to be 3309 and 3306; in two cases it is reported to yield better on 3309 than on 3306. Concerning du Lot, the evidence is contradictory. The fault found with it is excess of growth at the expense of yield, and not faulty affinity in the ordinary sense.

White Hermitage (*Uni Blanc*) has been grafted on—

A.R.G.I.	.. Striking success	(4)	—Satisfactory	(4)	—Unsatisfactory	(1)
du Lot	.. „	(2)	„	(5)	„	(nil)
3306..	.. „	(2)	„	(4)	„	„
3309..	.. „	(1)	„	(4)	„	„
1202..	.. „	(1)	„	(1)	„	(1)
420A	.. „	(1)	„	(3)	..	..
Metallica Cape	„	(nil)	„	(1)	„	(1)
219A	.. ..	..	..	..	„	(1)

This is distinctly a good scion, doing well on the majority of resistant stocks.

Brown Muscat has been grafted on—

1202..	.. Striking success	(2)	—Satisfactory	(12)	—Unsatisfactory	(1)
3309..	.. „	(1)	„	(7)	„	(nil)
3306..	.. „	..	„	(4)	„	„
A.R.G.I.	..	..	„	(3)	„	„
du Lot	..	..	„	(2)	„	(1)
420A	... „	(1)	„	(1)	„	(nil)

This scion has been mainly grafted on 1202; it was long held to be unsatisfactory on other stocks, a contention that is not borne out by this inquiry. Several growers report better yield on 3309 than on 3306; one grower, however, reverses this order.

Rutherglen Tokay (probably *Harslevelu*) has been grafted on—

du Lot	.. Striking success	(1)	—Satisfactory	(4)	—Unsatisfactory	(nil)
3309..	.. ..		„	(4)	..	
3306..	.. ..		„	(3)	..	
420A	.. ..		„	(1)	..	
1202..	.. ..		..		„	(1)

Rutherglen Tokay is a complete failure when grafted on 1202.

Rutherglen Pedro (true name unknown) has been grafted on—

du Lot	..	Striking success	(1)—	Satisfactory	(2)—	Unsatisfactory	(1)
1202..	..	,,	(1)	,,	(1)	..	
3309..				,,	(2)	..	
3306..	..			,,	(2)	..	
Metallica Cape		,,	(1)	,,	(1)	..	
420A	..			,,	(1)	..	

Chasselas grafted on—

3309..	..	Striking success	(2)—	Satisfactory	(5)—	Unsatisfactory	(nil)
3306..	..			,,	(3)	..	
du Lot	..	,,	(1)	,,	(2)	,,	(1)
Metallica Cape				,,	(2)	,,	(1)
420A	..			,,	(2)	..	
1202..	..	,,	(1)	..		,,	(1)
101–14	..			..		,,	(1)

Blue Imperial (Cinsaut) has been grafted on—

du Lot	..	Striking success	(1)—	Satisfactory	(1)—	Unsatisfactory	(nil)
3309..	..	,,	(1)	,,	(3)	..	
3306..	..	,,	(1)	,,	(2)	..	
A.R.G.I.	..			,,	(1)	..	

Malbeck has been grafted on—

du Lot	..	Striking success	(nil)—	Satisfactory	(1)—	Unsatisfactory	(8)
A.R.G.I.	..	,,	(1)	,,	(2)	,,	(1)
420A	..	..		,,	(1)	..	
62–66	..	..		,,	(1)	..	
106–8	..	..		,,	(1)	..	
1202..	..	..		,,	(1)	,,	(1)
3306..	..	..		..		,,	(2)
3309..	..	..		..		,,	(3)

Malbeck may be classed as the most glaring failure of reconstitution. It is giving more dissatisfaction than any other vine that has been grafted, so much so that it is not now being propagated to any extent. Its fault lies in excessive vigour and more or less complete failure to set its fruit at blossom, more especially when grafted on du Lot. A.R.G.I., 420A, and a few others seem to suit it, provided they are planted on land with a free subsoil.

Grenache has been grafted on—

du Lot	..	Striking success	(1)—	Satisfactory	(3)—	Unsatisfactory	(nil)
3306..	..	..		,,	(1)	..	
A.R.G.I.	..	..		,,	(1)	..	

Mondeuse has been grafted on—

420A	..	Striking success	(1)—	Satisfactory	(2)—	Unsatisfactory	(1)
du Lot	..	..		,,	(2)	..	
3306..	..	..		,,	(1)	..	
106–8	..	..		..		,,	(1)

The contradictory reports concerning this sort grafted on 420A are due to the heavy yield promoted by this stock. Unless much restricted

at pruning time, the vine suffers severely from over-production after the first two or three years of abundant yield. Grafted on 106-8 growth is poor.

Muscat of Frontignan has been grafted on du Lot and 101-14 with satisfactory results.

Alicante Bouschet has been grafted on—

420A	.. Striking success (1)	—Satisfactory (1)	—Unsatisfactory (1)
1202..	.. ..	„ (1)	..
A.R.G.I.	.. ..	..	„ (1)

Pedro Ximenes has been satisfactorily grafted on du Lot, A.R.G.I., and 420A.

Riesling has been satisfactorily grafted on du Lot, 3309, 420A, and Metallica Cape. In one reply it is stated that this scion gives a poor percentage of success when field grafted.

Doradillo has proved satisfactory on 3309, but unsatisfactory on 219A *and* 41B.

Pinot Blanc (*Semillon*) is satisfactory on du Lot (2).

Palomino is satisfactory on 3309, 3306, and 420A, but unsatisfactory on du Lot.

Calmette and *Carignane* are satisfactory on du Lot.

Blanc Select.—Satisfactory on A.R.G.I. (1), but unsatisfactory on 3309 and 101-14.

Mataro on—

du Lot	.. Striking success (1)	—Satisfactory (1)
3306..	.. ..	„ (1)

Durif on—

420A	.. Striking success (1)	—Satisfactory (1)
1202..	.. ..	„ (1)

Touriga is satisfactory on du Lot (1), 3309 (1), and 3306 (1).

Tempranillo and *Montils* do well on du Lot (1).

Burgundy (*Pinot Noir*) is satisfactory on 3309 (1).

Brachet is a rank failure on du Lot (1).

Merlot is unsatisfactory on all stocks on which it has been tried.

Concerning drying sorts and table grapes, the following notes have been received:—

Sultana (*Sultanina*) is satisfactory on A.R.G.I. (2) and on du Lot (1), and fair on Metallica Cape (1).

Gordo Blanco has been grafted on—

1202..	.. Striking success (nil)	—Satisfactory (1)	—Unsatisfactory (1)
3309..	.. ..	„ (2)	..
3306..	.. ..	„ (1)	..
du Lot	.. ..	..	„ (1)

Waltham Cross (*Rosaki*) has been grafted on—

3306..	.. Striking success	(1)—Satisfactory	(3)—unsatisfactory	(nil)
du Lot	.. „	(1) ..	..	
1202..	.. „	(1) ..	..	
A.R.G.I.	.. ..	„	(1)	..
3309..	.. ..	„	(1)	..
420A	.. ..	„	(1)	..

This seems to be a very good scion; one report states that it does well on all stocks on which it has been tried.

Purple Cornichon has been grafted on—

du Lot	.. Striking success	((1)—Satisfactory	(nil)—Unsatisfactory	(nil)
A.R.G.I.	.. ..	„	(1)	..
41B ..	.. ..	..	„	(1)
219A	.. ..	..	„	(1)

Snow's Muscat has proved a striking success on 1202, but is unsatisfactory on 3309 and 3306.

Flame Tokay is unsatisfactory on 219A and 41B (1).

Black Prince is a striking success (2) and also satisfactory (2) on 3309.

Lisbon or Raisin Des Dames (*Bicane*) is satisfactory on du Lot (1).

Ohanez has proved unsatisfactory on du Lot (1), not setting its fruit well.

Joannenc is unsatisfactory on 420 (1).

Red May does well on Von Mueller (1).

Sundry Table Grapes (not specified) are satisfactory on 3306 and 3309 (1).

If Planting Again?—

Replies to question 13 were not numerous. The combinations most favoured were—

Wine Varieties—

Brown Muscat on 1202 (8), on 3309 (4), on 3306 (1), on A.R.G.I (1).

Shiraz on 3306 (6), on 3309 (4), on 420A (2), on 1202 (1), on A.R.G.I. (1), on du Lot (1).

Mondeuse on 3306 (1), on du Lot (1), on A.R.G.I (1).

Tokay R. on du Lot (3), on 3309 (2), on 3306 (1), on 1202 (1), on 420A (1).

Pedro R. on 1202 (3), on 3306 (2), on 3309 (1), on 420A (1).

White Hermitage on 3306 (2), on 3309 (1), on A.R.G.I. (1), on 420A (1).

Chasselas on 3309 (2).

And one each for the following:—Malbeck on du Lot, Grenache on 3306, Grenache on du Lot, Mataro on 3306, Pedro Ximenes on du Lot, Durif on 420A, Alicante Bouschet on 420A, Semillon on du Lot, Riesling on 3309, Pinot Noir on 3309, Touriga on 3306, Touriga on 3309, Cinsaut on A.R.G.I.

Drying and Table Sorts—

Sultana on A.R.G.I. (2), on du Lot (1), on 1202 (1).
Gordo Blanco on 1202 (1).
Waltham Cross on A.R.G.I. (2), on du Lot (1).
And one each for the following:—Black Prince on 3309, Purple Cornichon on du Lot, Purple Cornichon on A.R.G.I., Red May on A.R.G.I., and St. Jeannet on 420A.

Influence of Stock on Yield.

Question 10 elicited 22 replies, the majority of which were somewhat indefinite, the influence of the different stocks on fruit production not being considered sufficiently marked to permit positive conclusions. It was, however, definitely stated in several different quarters that Shiraz yields better when grafted on 3309 or 3306 than on Rupestris du Lot, though the growth is stronger on the latter. On this point the evidence is somewhat contradictory. Some growers find du Lot a highly satisfactory stock for Shiraz, whilst others condemn it altogether. Explanation of such conflicting opinions is, no doubt, that, according to circumstances, increased vegetative growth may be advantageous or otherwise as regards fruit production. Good yields cannot be expected unless the vines are strong enough to bear them. On poorer land the stock that increases vegetative growth may thus bring about an increase in yield. On richer soil, where growth is naturally strong, it may, on the contrary, lead to a reduction, the vine growing wood at the expense of the fruit. Shiraz on du Lot was found to have better growth and better fruit than on Metallica Cape, growing alongside. The latter is classed as giving a good, though uncertain, yield. In several replies, vines grafted on 3309 were held to yield better than the same sorts on 3306; in a couple of cases these positions were reversed. Relative increases in yield were reported for Mondeuse on 420A and Shiraz on 3306 and 3309, and decreases with Shiraz on A.R.G.I. and 101-14. No. 420A is generally held to communicate marked fruitfulness to vines grafted on it. In the case of free bearers, such as Mondeuse, this exposes the vine to suffer the usual consequences of over-production, unless guarded against by rather hard pruning. Good yields were reported for Pedro R. and Brown Muscat on 1202—also that equal fruit production was obtained each year from Waltham Cross on A.R.G.I. and 3396 and from Shiraz on 3309.

Drought Resistance.

To question 11, 31 replies were received. The evidence brought to light is not very definite, and sometimes contradictory. The majority have not noticed any marked difference in the behaviour of the various stocks in a dry season.

Some claim good drought resistance for vines grafted on Rupestris du Lot, holding it to be one of the hardiest of stocks, whilst others, on the contrary, look upon it as only mediocre in this respect.

Specific cases of good drought resistance mentioned, are Tokay, Shiraz, and Blue Imperial on du Lot—on the other hand, there are complaints concerning Semillon and White Hermitage grafted on it; they suffer in a dry season, the last named showing a tendency to shrivel slightly before ripening.

One grower significantly remarks that his heaviest bearing vines suffer most from drought. Another states that site and soil seem to be the chief agents. The scion variety also plays an important part, considerably modifying the specific resistance of the stock. A scion which grows into a large vine with abundant foliage must obviously be more exacting in moisture than a smaller and more wiry one.

Further cases of good drought resistance recorded by one grower are Brown Muscat on 1202 and White Hermitage on A.R.G.I.; Chasselas on 3306 occupying third place.

Another grower mentions Calmette on 420A and White Hermitage on A.R.G.I. A third finds 1202 grafted with Brown Muscat, and 3309 and 3306 grafted with various scions, to stand equally well. A fourth considers that Shiraz on 3309 and Chasselas on 34E show much promise.

Better resistance is claimed by some, for vines grafted on 3309 than for the same sorts on 3306.

In several replies 420A is said to show marked drought resistance, the grapes hanging well on the vines, which keep their leaves green for a longer time than on some other stocks.

Further Remarks.

Some points of interest are touched on in answers to question 14.

Several of these stress the advantages of early sub-soiling and getting the land into perfect tilth, in time to permit early planting, which gives far better results, both as regards strike percentage and vigour of growth than the October planting, sometimes rendered inevitable owing to late sub-soiling, delayed by winter rains.

Summer sub-soiling is strongly advised. This is quite feasible on land deeply fallowed the previous winter and properly cultivated to retain sufficient sub-soil moisture.

One reply states that gross bearers, such as Uni Blanc, seem to exhaust the stock, more particularly Metallica Cape, just on ripening period. 3309 is considered the best all-round stock. Drought resistance is held by one grower to be increased 30 per cent., if the resistant vine is originally planted in the vineyard as a cutting and not as a rootling.

A reply received from Mildura (an irrigated vineyard) states that sultanas grafted on A.R.G.I. make very rank growth and smother their crop unless canes are left very long. Fifteen feet is not too long for a very strong cane.

The advantages of the Yema or summer bud graft and its superiority over ordinary spring grafting are several times referred to. Also the need for very thorough tillage of the young vineyard during the first two years.

As one grower puts it—"Time is well spent in hoeing, scarifying, and harrowing young Americans in spring and summer before budding."

Summary.

The present paper is the outcome of an inquiry into the results achieved by the Victorian vineyards, reconstituted on Phylloxera resistant stocks.

A questionnaire was sent to all growers who have been supplied with resistant vines from the State Vine Nurseries during the past 25 years. From a detailed examination of the 52 replies received the following conclusions may be drawn:—

1. Reconstitution on Phylloxera resistant stocks has proved a marked success in those parts of Victoria where it has so far been carried out. The great majority of growers are altogether satisfied with the results obtained from their re-planted vineyards.

2. The soil conditions in the reconstituted areas are very suitable for resistant stocks. Soil adaptation troubles, so frequent in other countries, are rare in this State. The problems which confront us concern the suiting of scion to stock, rather than that of stock to soil conditions.

3. The suiting of scion to stock is of very real importance. Troubles occasionally present themselves in the shape of curious incompatibilities, concerning which the only reliable guide is previous experience. Their number is, fortunately, small.

Undesirable combinations (stock and scion) are of two types—(*a*) Those where affinity is faulty, causing the grafted vine to decline and die at an early age; example: Tokay on 1202. (*b*) Too exuberant growth at the expense of fruit production; example: Malbeck on du Lot.

The tables given above show the combinations which have been proved satisfactory and otherwise in our vineyard practice.

4. Among stocks which show a wide range of suitability for different scions may be mentioned 3309, 3306, A.R.G.I., and 420A.

Among stocks, for which the choice of scion is less easy, are: 1202, Metallica Cape, 101-14, and, to a lesser extent, Rupestris du Lot. The chief fault of the last named is excessive growth at the expense of fruit production.

5. Scion varieties are also "easy" and "capricious." Shiraz, Uni Blanc, Sultana, and Waltham Cross are easy scions, giving good results on most of the leading stocks. Among capricious scions may be mentioned Tokay, Ohanez, and Malbeck.

6. The influence of the stock on fruit production, though marked in some cases, is variable in others and dependent on several factors. Stocks which promote heavy growth sometimes reduce yield.

7. Concerning the influence of the stock on resistance to drought the evidence is somewhat indefinite and sometimes contradictory. In properly tilled vineyards the drought resistance of vines grafted on the leading stocks is generally satisfactory.

PREPARATION FOR PLANTING POTATOES.

An address by J. T. Ramsay, Potato Expert, broadcast through 3LO.

In outlining the cultural operations by which land intended for a potato crop may be prepared, it is impossible to lay down any hard and fast rule which would suit all sorts and conditions of soils. This is so because there is an infinite variation in the soils themselves—they may be sandy, may be clay, or they may be any of the multifarious gradations between these two extremes.

Geographical position environs soils with climatic conditions, which demand very varying treatment; also the time at which they can be treated most advantageously will differ in different districts. But, notwithstanding all of these variations, the object to be aimed at in preparing soil for a potato crop, or any crop demanding, as the potato crop does, intense culture—that object is the correct mechanical condition of the soil.

Correct mechanical condition of the soil is expressed amongst agriculturists as tilth. Tilth is a term used to describe a condition of soil which, when the term is justified, signifies that that land is in such an ideal state and subdivision of soil particles as makes it a perfect host for the reception of the seed of the potato or other intense culture crops.

Many land-owners who are possessed of country which is naturally very fertile do not seem to appreciate the necessity of producing this condition of soil for the reception of seed. They seem to consider that since they are planting seed in rich land the seed ought to be thankful that it is being entertained by such a wealthy host. A host may be wealthy, and yet be inhospitable. So, also, soil may be rich, and yet be in such a poor physical or mechanical condition as to render it entirely unsuitable for the free development of plants of high economic value.

An extreme illustration of this can be given by pointing out the possibility of having a portion of soil containing a superabundance of plant food submitted to such pressure as would give it the consistency of a piece of basaltic rock. In such a state it would be absolutely useless as a medium in which to produce a crop of any kind.

So much for destructive criticism: now for constructive advice. The production of genial conditions for the reception of the seed of the potato crop is secured by the utilization of such implements as will disintegrate or break apart from each other soil particles, and so reduce the soil to a condition or tilth which will make it amenable to the needs of the crop.

There are several good reasons why this tilthiness or good mechanical condition of the soil is necessary. Let me cite three—first, that the roots of plants can branch out without restriction in search of food; second, that useful bacterial activity is permitted to the fullest degree; and, third, that percolation of moisture is promoted and evaporation of moisture is retarded.

To produce this desired tilth there is one farm implement which stands out far ahead of all others—that is the mould-board plough. No matter what the condition of the land is, whether in grass, stubble, or fallow, it is wonderful what a tremendous difference a couple of ploughings with the mould-board plough will make. The most unpromising looking of unkempt soil, hoary with weeds perhaps, treated to two cultivations with the mould-board plough at intervals of, say, two to three weeks, will be transformed to a degree of tractability which will permit of its being used as a seed bed with every chance of success. Wherever the depth of the soil will permit, the first ploughing should be to a depth of 7 to 9 inches, and the second about 2 inches shallower.

There are many lands with the top soil so shallow that this depth is out of the question. On land where the surface soil does not extend below from 5 to 6 inches, great care should be taken not to plough to a greater depth than the surface soil.

If greater depth be ploughed and some of the subsoil brought to the top, very great harm will result. In extreme cases, this harm may amount to almost absolute uselessness of the paddock for some years. On that account, care must be taken that none of the subsoil is brought to the surface, or, in other words, the depth of the surface soil must not be exceeded when ploughing.

There are other implements, of course, which play an important part in the production of a good condition of soil for seeding; these are the disc or spring-tooth cultivators, the roller, and the harrows. After the second ploughing the disk cultivator or the spring-tooth cultivator should be used to further break down the soil as left by the plough. It is possible that only one or two strokes of either of these cultivators will be necessary to produce the desired effect. That is a point on which the operator alone can decide, but it is always well to err on the side of over-cultivation than on the side of under-cultivation.

It is not necessary or advisable to work down too finely the land intended for a potato crop, as in the event of heavy rain falling it is liable to run together and become so closely set as to necessitate the whole of this labour of ploughing and cultivating being gone over again.

Under normal conditions, however, if the two ploughings and disc or spring-tooth cultivations are given, the land may be allowed to lie in that condition until the actual time of planting takes place. In the event of rain falling in any quantity subsequent to these operations, opportunity should be taken as soon as the ground is in fit condition to carry horses or tractor to run over it again with one or other of the cultivators. Harrowing at this stage is not necessary, and should be left until just before planting commences.

It is important at this season of the year to go over seed stocks to prepare them against the approaching planting time. Seed which is stored in boxes will require very little attention owing to the fact that such seed keeps in the best of condition. But it is just as well to look over these and remove any which have dried off through having been injured at digging time by the fork or machine, and also to remove any which show signs of spindle growth or decay from disease.

This saves carting these useless tubers on to the paddock, where they would probably be left on the headland at planting time to further spread the cause or causes of their decay. In cases where seed has been stored in bags or pits, attention and overhaul is much more necessary than where the seed has been stored in standard boxes. This is a very important routine operation, and should be attended to at once. Every effort should be made to prevent seed from over-sprouting, and so weakening the seed tubers and increasing the danger of damage to the sprouts. To prevent this, pits should be opened up and their contents turned over.

While this is being done, opportunity should be taken to remove all tubers which are damaged from any cause whatever. Except in exceptional cases there is sure to be found some which have been pitted and a varying percentage of tubers in which bacterial rot has made headway since the time of their being placed in this storage.

After sorting over and eliminating affected tubers, it is advisable that the contents of the pits be spread out at a shallow depth, say, not more than about 4 inches in depth, preferably under trees. If this is done, the tender white shoots now showing will be hardened off by the action of the light. The same agency will green them and render them tough. By this means they will be rendered fit to withstand the handling incidental to planting without sustaining much damage. Another beneficial effect of opening up the contents of the pits and spreading them out is that excessive growth of the sprouts will be checked.

It is of fundamental importance that the original sprouts on the tubers be kept intact so far as possible. If these be damaged or broken off the seed is considerably weakened and its value much reduced.

Even though the shoots be broken off, in the majority of cases they will grow again, but the subsequent growths will be very much less vigorous than that from the original bud. This is a most important point, and one well worth the considerate attention of growers.

Where seed has been stored in bags, excessive sprouting can be prevented by turning the bags upside down at first, and reversing the standing position of the bags about every week or ten days.

While this periodic inversion of the bags will tend to check the growth of the sprouts, there will be considerable damage done to the young sprouts, many of which will suffer bruising or breakage. Because of this, it would be much better if seed which has been stored in bags were subjected to the same treatment as that already recommended for seed potatoes which have been stored in pits, viz., have them opened right up, overhauled, and spread out to the light and air until such time as they are required for planting.

It would be difficult to estimate the annual loss to the potato-growers of Australia through faulty storage of seed potatoes, but it must run into thousands of tons in the aggregate. This is a great pity when the greater part of this loss could be obviated by the use of the proper seed potato boxes. These storage boxes, or trays, are now standardized here, and are so well known as to make their description

unnecessary. Since I first introduced them into Victoria a large number of the growers in the more important potato-growing districts of Victoria have adopted them for use, and they are becoming increasingly popular. It is safe to predict that before many years the growers of consequence who do not practise this well proved and highly economical system of potato seed storage will be the exception and not the rule.

The last point I have to touch on is that of manure. Australian growers have to rely almost wholly on artificial manures to fortify the fertility of their soils up to the standard required by the potato crop.

Care should be taken to have orders for manure placed with agents in ample time, so that delivery can be made early. A variation in weather conditions may render it advisable to plant earlier than usual, and because of this it is well to have the manure on hand in good time.

Only general advice can be given here as regards manures and the rate per acre at which they should be applied. For the late districts in Gippsland, in which planting will commence at the end of this month, up to 5 or 6 cwt. of superphosphate and 1 cwt. of sulphate of ammonia can be allowed for. Late central districts, which embrace the red volcanic belt, do not require anything more than 3 cwt. of superphosphate per acre.

EGG-LAYING COMPETITION.

WINTER TEST AT BURNLEY.

By W. C. Rugg, Chief Poultry Expert.

In the egg-laying competition conducted by the Department of Agriculture at the Burnley School of Primary Agriculture and Horticulture, what is known as the Winter Test extends from the beginning of the competition, 1st April, to the 31st July.

There is no doubt that the change in the system by which certificates are awarded to the birds laying the eggs of the highest market value instead of to those laying the greatest number of eggs, is responsible for the fact that the birds competing this year are of better stamina and quality than have been seen at Burnley for some years.

This was the opinion expressed at the commencement of the competition by both visitors and owners of competing birds, and that impression has been supported so far by the results of the Winter Test (which is for the first 122 days of the competition), as in each section the leading birds have laid a greater number of eggs, and eggs of higher market value, than did the prize winners in the same period last year.

Details of Best Performances in 1926.

Section A.—Groups of Six Birds.

Class 2.—White Leghorns—Dry Mash.

The record of 498 eggs laid by Mr. A. J. Hill's team was very good, as out of this total there were only 26 eggs of second grade. A member of the team, bird No. 2, won the certificate for the greatest value of eggs produced by an individual bird in the teams test (Light Breeds). She laid 101 eggs, only one of which was second grade.

Mr. J. J. West's team, which is competing in the Wet Mash Section of the competition, laid 516 eggs during the period of the Winter Test, but as 112 of them were of second grade the team received only second place. One of the team, bird No. 3, laid 105 eggs, but as twenty were second grade, she gained only the second prize for the greatest value of eggs laid by an individual bird.

Class 3.—Black Orpingtons—Wet Mash.

Mr. G. J. White's team of six put up a very fine performance indeed in laying 537 eggs, only one of which was second grade.

Mr. Wear's bird No. 4 won the certificate for the greatest value of eggs laid by an individual bird in this section. Her total was 110, one of which was second grade.

Mr. Cullen's bird No. 6 takes second place; she laid 109 eggs, all of which were first grade.

It is often stated that Black Orpingtons lay small eggs, but it is pleasing to note that there are breeders whose birds lay eggs that rarely fall below standard size. The performance of Mr. White's team (a total of 537 eggs, only one of which was second grade) is a very good one. Messrs. Wear and Cullen are also to be congratulated on the performances of individual birds in their team.

All the competitors mentioned are strong birds, with good constitutions, and are just the stock that are wanted from which to breed stock for distribution.

Section B.—Individual Birds.

Light Breeds.

The certificate for the bird in the light breeds section laying eggs of the highest value during the Winter Test was won by Mr. T. A. Mentiplay's pullet. Her record for the 122 days of the test was 112 eggs. This is the highest number of eggs laid at Burnley by a White Leghorn for the Winter Test.

The second prize was awarded to Mr. G. McDonnell, whole pullet laid 97 eggs, all of them first grade.

Heavy Breeds.

Mr. Mentiplay is also the winner in the heavy breeds section with a Black Orpington pullet that laid 115 eggs, only one egg less than the Burnley record for the Winter Test held by Mr. Siede.

The second prize in this section was won by the D.C.S. Poultry Farm, with a pullet that laid 104 eggs, only three of which were second grade.

Records of Prize Winners—Winter Test.

SECTION A.

	Name and Address of Owner.	Breed.	Pen No.	Bird No.	No. of Eggs. 1st Grade.	2nd Grade.	Under-weight.	Total.	Value. £ s. d.
Light Breeds.									
		Group of Six Birds.							
First Prize (Champion Certificate)	A. J. Hill, Sunraysia Poultry Farm, Greensborough	White Leghorn	30	..	472	26	..	498	4 9 9·35
Second Prize (Government Certificate)	J. J. West, 248 McKean-street, North Fitzroy	,, ,,	8	..	404	112	..	516	4 8 4·97
		Individual Birds.							
First Prize (Champion Certificate)	A. J Hill, Sunraysia Poultry Farm, Greensborough	,, ,,	30	2	100	1	..	101	0 18 8·08
Second Prize (Government Certificate)	J. J. West, 248 McKean-street, North Fitzroy	,, ,,	8	3	85	20	..	105	0 18 3·68
Heavy Breeds.									
		Group of Six Birds.							
First Prize (Champion Certificate)	G. J. White, Allwell Poultry Farm, Glen Huntly	Black Orpington	46	..	536	1	..	537	4 19 11·33
Second Prize (Government Certificate)	J. Wear, Nonpariel Poultry Farm, Werribee	,, ,,	44	...	380	87	25	492	4 2 4·22*
		Individual Birds.							
First Prize (Champion Certificate)	J. Wear, Nonpariel Poultry Farm, Werribee	,, ,,	44	4	109	1	..	110	1 0 3·17
Second Prize (Government Certificate)	W. Cullen, Werribee Poultry Farm, Werribee	,, ,,	48	6	109	..	..	109	1 0 0

* Bird No. 2 died 29th May, 1926.

Prize Winners—*continued.*

SECTION B.

—	Name and Address of Owner.	Breed.	Pen No.	Bird No.	No. of Eggs.				Value.
					1st Grade.	2nd Grade.	Under-weight.	Total.	£ s. d.
Light Breeds.									
INDIVIDUAL BIRDS.									
First Prize (Champion Certificate)	T. A. Mentiplay, Somerville ..	White Leghorn	193	..	109	3	..	112	1 0 7·16
Second Prize (Government Certificate)	G. McDonnell, 150 Camberwell-road, Auburn	,, ,,	98	..	97	..	..	97	0 17 9·17
Heavy Breeds.									
INDIVIDUAL BIRDS.									
First Prize (Champion Certificate)	T. A. Mentiplay, Somerville ..	Black Orpington	29	..	95	20	..	115	1 0 4·41
Second Prize (Government Certificate)	D.C.S.P. Farm (R. Ross), 9 Blackstreet, Middle Brighton	,, ,,	27	..	101	3	..	104	0 19 1·96

THE TOBACCO INDUSTRY.

An Address by Temple A. J. Smith, Tobacco Expert Broadcast through 3LO.

Tobacco-growing in Victoria has been followed with varying success by farmers for well over 50 years. During the years from 1870 to 1888, quite 90 per cent. of the tobacco leaf was produced by Chinese, who, while being industrious workers, paid little attention to quality in their product, the main idea in their minds and methods being to grow the heaviest crops possible. This naturally led to the production of a low-grade heavy tobacco, which was cured in open sheds in a most unscientific way, the result being an inferior leaf of poor-smoking quality, which to-day would not appeal to smokers.

During the past ten years, the industry has developed upon new lines. The Chinese growers have been eliminated, and of the tobacco leaf now produced, at least 90 per cent. is grown by white labour. Better types and varieties are used, and a system of flue-curing the leaf has been introduced which greatly improves the smoking qualities of the tobacco and its general appearance.

As evidence of the improvement effected, let me say that air-cured leaf exported to the London market in 1901 sold at 5d. and 6½d. per lb.; while flue-cured leaf sent to London in 1921 was valued by experts at 1s. to 1s. 9d. per lb., and the general qualities of the leaf were favorably commented upon. Further, the opinion was expressed that, if further consignments of similar leaf were sent to London, a ready market would be found for it at the prices quoted.

So far, experience has shown that Victoria produces tobacco better suited for the pipe and cigarette than for cigars. This is probably due to climatic influence, as Queensland apparently grows better cigar leaf than pipe tobacco; and it appears as though Australians will find that in the future our different States will produce different types, as is the case in America, where time has proved that various types are suited to different districts, and each has become noted for its special product.

Australians are said to smoke, as a whole, a higher all-round grade of tobacco than any other people, consequently, it is incumbent upon our growers to make every effort to produce leaf of high quality so as to enable the manufacturer to provide smokers with the tobacco they require.

The popular taste is trending more every year towards the lighter kinds of tobacco, and the consumption of cigarettes has increased enormously during recent times, while cigar smoking has gradually decreased during the same period. This statement applies also in other countries.

The area under tobacco in Victoria is gradually increasing. In 1922-23, it was approximately 600 acres, while in 1924-25 the 1,000-acre mark was reached, and there is an evident intention shown by growers to cultivate a larger area in the coming season.

Manufacturers use in the neighbourhood of 17,000,000 lb. of leaf annually. Its value is nearly £3,000,000; but Australia produces only

about 12 per cent. of the quantity required. Consequently, there should be ample scope for expansion of the local industry, provided the right types are grown, and there can be no doubt that there is plenty of land suitable in the Commonwealth to produce the major portion of the tobacco required for Australian consumption.

The British-Australasian Tobacco Company buys nine-tenths of the leaf grown in Victoria, and guarantees to take 1,500,000 lb. of tobacco annually at prices ranging from 6d. to 2s. 6d. per lb., according to the grade of leaf submitted. This guarantee is for three years, and has been renewed from previous years.

The import duties on foreign leaf entering Australia to be locally manufactured are 2s. and 2s. 6d. per lb.; upon manufactured tobacco, 5s. 4d. per lb.; and on cigarettes, 11s. 6d. and 12s. per lb.

Imported leaf and Australian leaf each pay the same excise duty, namely, 2s. 4d. per lb. Australian leaf is therefore protected to the extent of 2s. per lb. as compared with imported.

The actual work involved in growing and curing a tobacco crop, though continuous, is not heavy, and smart boys can do much of the work as well as men. But the crop must not be neglected. Constant cultivation during the growing period is essential, and each individual plant has to be watched for insect pests from the time of transplanting to harvest time—a period of from three to five months.

Modern machinery, such as transplanting machines, double-row cultivators, &c., has done much to lighten the labour of tobacco growing. All the required machinery can be purchased locally; in fact, the transplanter is now made by a manufacturer in Wangaratta.

That tobacco culture is being firmly established in Victoria is evidenced by the well-equipped tobacco farms to be found in the north-eastern and other tobacco-producing districts, where fine permanent curing-barns and packing-sheds have been built, many of them of concrete and brick.

The average area cultivated by one man for this crop is approximately 7 acres, but there are several farms on which areas of from 20 to 70 acres are grown. A considerable amount of labour is employed as compared with that required by other crops. Five acres will keep one man occupied during the growing season, and at harvest-time the same area will require two men. It is a busy and interesting scene on a tobacco farm during the harvesting and curing season.

The cost of producing a crop of tobacco where the farmer devotes his whole attention to it is estimated to be £45 per acre; but where a farm is used for other forms of production, the cost is considerably less.

The crop is a somewhat uncertain one, and is liable to varying fluctuations due to unsuitable seasons and the ravages of a disease known as Blue Mould, which at times attacks the crop, and for which, up to the present, no certain cure or means of prevention has been found. Growers with experience state that one good year in three can be expected, and in the remaining years partial crops may be obtained.

The average yield of cured leaf per acre for Victoria, taken over the last 20 years, is 600 lb., and in a good season yields of 1,000 lb., and up to a maximum of 1,500 lb., have been harvested. The average price in recent years is just under 2s. per lb., so it will be seen that in

ordinary years there is a good wage to be made out of tobacco-growing, and in good seasons a handsome profit.

The capital needed to start a tobacco farm is small as compared with many other farming propositions, as the area required is not large, and the machinery not expensive. It is, however, wise to make tobacco-growing a part of the farm's operations, and a system of mixed farming including tobacco will be safer than placing dependence in one crop only.

Experience in tobacco culture is necessary to achieve the best results, and it is generally conceded that a two years' course is advisable on a tobacco farm, especially where a man has not had any previous farming experience. This two years can be spent either on the share system, or else a position on wages can be obtained. This apprenticeship, if it may be so called, will be found cheaper in the end, and serves to try out the suitability of the man for the job, which is of much importance.

Climate and soil have a marked effect on the various qualities required in a good tobacco, which must have good flavour, aroma, texture, colour, and combustion. The general impression appears to be that only rich soils are suited to tobacco culture. This is not the case; as a matter of fact, rich soils produce heavy, strong tobacco, which is not the type wanted to-day. It contains a high percentage of nicotine, in some cases up to 6 per cent., whereas the best smoking leaf contains only 1½ to 2½ per cent. The leaf is coarse, and with thick texture, heavy veins and midrib. The colour, also, is liable to be dark, and the flavour too strong.

The soils most suitable for the production of the best types of pipe and cigarette leaf are those sandy or shaly to a depth of 9 or 10 inches overlying a yellow or reddish porous subsoil. These soils produce the Lemon and Bright Mahogany tobaccos, which command the highest prices, though the yield per acre in weight will be less than in the case of other varieties. Heavy fertilizing is necessary on these soils, and if judiciously done, will have the effect of increasing the yield and improving the quality at the same time. It is important that varieties suited to the different soils be used to produce the types required, as with vines and many fruits, otherwise a nondescript tobacco will result.

All soils in which tobacco is grown must be well drained, and heavy clay soils which have a high moisture content should be avoided, as they grow only a coarse, low-grade leaf. Soils containing an undue proportion of chlorine or salt will produce a bad burning tobacco, which is fatal so far as the market is concerned. It is not good to choose dark soils, or soils containing too much iron, as these have a bad influence on flavour and colour. Of the tobacco grown in this State, the greater part comes from the north-east, along the valleys of the King and Ovens rivers, where it is grown on grey sandy loams, which, with heavy dressings of superphosphate, give good results.

A comparison of Victorian and American soil analyses made by Dr. F. J. Howell, when Chemist for Agriculture, shows that the average figures of the important plant foods in the six Victorian tobacco fields, with the two American, will disclose percentages in the Edi soils practically equalling those of Kentucky, and considerably surpassing those of North Carolina.

Climate has a marked influence upon tobacco, especially in respect to flavour and aroma. In warm climates, the tobacco will be aromatic; in a cool climate the leaf will be thinner, with less aroma. Where the rainfall is very heavy, as in Sumatra, and the growth is very fast, the leaf is fine in texture, but has little aroma. The texture of Sumatra leaf is so fine that 1 lb. is sufficient to wrap 500 cigars. At the same time, this leaf is used only for wrapper purposes, and a cigar made entirely from Sumatra leaf would not be a good smoke.

A rainfall of from 25 to 35 inches is generally considered necessary, and a fair proportion should fall during the growing months—that is from November to March. A fairly warm temperature is desirable, especially for the first three months of the year, which is the ripening season; and if during March the days are warm and the nights cool, the tobacco will colour better and the aroma will be improved.

Heavy winds do much damage, both in retarding growth in the earlier stages, and later in breaking and bruising the leaves. Dust storms have a particularly bad effect during the ripening period, for then the tobacco leaves, being gummy, dust and sand become imbedded in them and depreciate their value. Windy sites must be avoided, or if selected, wind-breaks must be planted to prevent damage. Frosts are liable to injure the crop, and serious losses are sustained from this cause at times. Generally speaking, tobacco should not be grown where there is danger of heavy frost between the months of November and April. A method of protecting crops from frosts is by means of smoke-screens; but this scheme of preventing injury is seldom employed here.

In exceptionally dry seasons, irrigation is practised, where possible, with advantage; but the quality of the tobacco is usually better when grown under natural conditions, and care should always be taken to apply the water before the flowering stage, otherwise the tobacco will be liable to a second growth, which is detrimental to the smoking qualities.

As a general rule, tobacco should not be grown nearer the coast than 30 miles, the salt in the ocean breeze having a bad effect on combustion. There are, however, exceptions to this rule where the tobacco field is protected by hills or trees, and in a few cases some good tobacco has been grown in Victoria 10 or 12 miles from the sea.

The seed of the tobacco plant is very small, 1 oz. containing between 300,000 and 400,000 seeds. The Department of Agriculture every season acclimatizes seed at the Government Nursery, Wahgunyah, and from time to time imports up-to-date varieties from America and elsewhere. Growers are supplied with the varieties required at a cost of 3s. per oz., and 1 oz. of seed will produce sufficient plants for 4 to 5 acres, so that the cost per acre for seed is a mere bagatelle. Every grower should pay great attention to seed selection where he saves his own seed, in order to preserve the right type.

Notwithstanding the fact that the seed is so small, its vitality is extraordinary, and if stored in a dry place in glass jars, it will, when sown under the right conditions, germinate freely after being kept for 20 years.

It has been proved advisable to save in a good season sufficient seed to last for several years, as seed saved year by year is liable to lose its type, and in unsuitable seasons will not have the same vitality.

Before concluding, I would like to warn intending tobacco-growers that not every man is capable of becoming a good grower. For success, the work must be well and carefully done, and the man who thinks he has merely to throw the seeds on the ground, and that there will spring from them plants that will produce ready-made cigarettes, will be badly disappointed.

Though the work of tobacco-growing is not heavy, close attention is essential, and the man who brings intelligence to the task is the one who will come out on top.

There have been some very nice cheques made from tobacco, and there will be more when proper treatment becomes more general. Only a few districts have taken up tobacco-growing as a commercial enterprise, and there are many parts of the State which possess suitable soils and climate yet to be exploited. Land fitted to produce high-grade leaf need not be high-priced, and, owing to its high value per ton, tobacco can be made to pay even when grown at long distances from a railway. Tobacco will keep for several years if properly stored; in fact, the leaf improves with age up to six years.

There can be no doubt that the industry will expand in the near future. The Department of Agriculture, through its experts, is willing to assist intending growers with information and demonstrations, and will let them have small quantities of seed for experimental purposes free of charge.

Already good tobacco is being grown and made from local leaf, but there is room for much more if the right steps are taken to produce the desired qualities.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead. Even a dry dusting with lime or with ordinary soil will keep the slugs in check.

For cherry aphis, the trees should be sprayed at once with nicotine-sulphate.

Codlin moth spraying, too, will be in evidence this month. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Arsenate of lead may be mixed with nicotine sprays, or with Bordeaux mixture, without any detriment to either spray, if necessary.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

REMINDERS FOR NOVEMBER.

CATTLE.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Journal of Agriculture*, November, 1923, page 659. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will. Provide salt-lick consisting of 20 lbs. bone meal or rock phosphate, 20 lbs. slacked lime, 20 lbs. salt, and ½ lb. sulphate of iron.

PIGS.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. Give plenty of charcoal. If pigs are lousy, dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

SHEEP.—Prepare for dipping. Ascertain exact contents of bath before mixing.

The worried existence led by sheep which are constantly tormented by ticks and lice reacts on and seriously depreciates the quality of the wool and the condition of the sheep, and especially of lambs. If sheep are found to be ticky or lousy they should be dipped immediately, so as to relieve without delay the irritation caused by vermin. Irritation soon causes the sheep to become restless and to scratch against posts and logs, thereby making them fail in condition and causing loss by the tearing of their fleece. Dipping, if the proper materials are used, and the work is properly carried out, is one of the most valuable investments that any owner of sheep can make. It gives returns which more than compensate for the trouble and expense incurred. When a sheep-owner becomes accustomed to using a certain dip as effectively as he should, it is then that he appreciates the results most.

Dipping does not make the wool grow where none grew before, but it keeps the skin healthy, and so enables it to grow a healthy wool. If a sheep's life be spent in feeding and sleeping, it will naturally grow a better fleece than if

it has to spend time in scratching and biting, and thus losing part of the wool it has already grown. An important factor in some dipping is to keep the liquid in the dip in motion by constant stirring, as, if it is allowed to settle, the light insoluble matter floats on the top of the water, and may be the means of poisoning sheep if taken by them when passing through the dip. Valuable sheep have been poisoned in this way. Whatever brand of dip is used, the instructions accompanying it should be faithfully followed.

Lambs should not be put through the dip when thirsty, as they may drink as they swim through. For the same reason they should be kept away from any small pools in the vicinity of the exit from the draining pens. Sheep just dipped should not be put on to grass before they have dried, as the drip of the bath on the grass may cause poisoning.

Never allow the rams to join the ewes after dipping until the ewes have dried, and the same applies to the lambs and their mothers. Never hurry sheep through a dip; some cannot swim as fast as others; give them plenty of time, they can swim a fair distance in one minute, which after all is not long to wait. Their heads should be pushed under two or three times, but on no account held under. Care must be taken to see that the animal is thoroughly saturated to the very skin. Remember that the dip has to contend against the greasy nature of the fleece and skin and must be allowed time to do this. So many dipping operations fail on account of insufficient immersion, often due to the hardness of the water. Always be careful to dip every sheep, because a few undipped infested ones may reinfest the dipped sheep. It is important that sheep in the one district should be dipped about the same time, so as to avoid chances of reinfestation.

BEE-KEEPING.

In most districts, October is the principal swarming month; in late localities, particularly at the higher elevations, most of the swarming takes place in November. Where a honey flow is expected from Redgum or Yellow Box during December and January, it is not wise to make a further increase in the number of colonies by allowing after-swarms to come off and hiving separately, as the parent stock would be too much depleted of bees, and there would not be sufficient time for it to recover, or for the swarms to build up, before the honey flow is on, and much of it would therefore be lost.

After-swarms can best be prevented by hiving the first or prime swarm on the old stand and moving the colony from which it came to a new stand, at the same time destroying all the queen cells in it except one—the most perfect and forward one.

If no increase at all is desired, the parent colony may be left alongside the old stand on which the swarm was hived, but with the entrance facing in a different direction. When the young queen in the swarmed stock is laying, which will be in about three weeks, the hive may be gradually turned round till it faces the same way as the swarm, and, after removing the old queen from the swarm, the two stocks may be re-united, thus making a very strong colony with a young laying queen, in the best condition for storing honey and very unlikely to swarm again the same season.

The uniting of the two stocks is best done towards evening, by first giving both a little smoke between the combs and then alternating them for the time being, so that each comb from the swarm is between two of the old combs, the object being to thoroughly mix the bees. Two or three days after, the combs can be sorted; the best should be selected for the brood chamber and the others put in the upper story. Uniting should not be attempted till after the young queen is laying, otherwise there will be much fighting.

In localities where the colonies have come through the Winter very strong, there is likely to be much swarming wherever Cape Weed or some other pollen-yielding plant is plentiful, the duration of blooming and of swarming depending, of course, upon the weather.

When several days of bad weather follow the hiving of swarms, it may be advisable to feed sugar syrup (one part sugar to one part water) to keep up comb-building and brood-rearing, so as to have the greatest number possible of field bees in the hive during the honey flow later on. Honey should never be used for feeding bees, unless it comes from an apiary which has been absolutely free from disease for at least two years.

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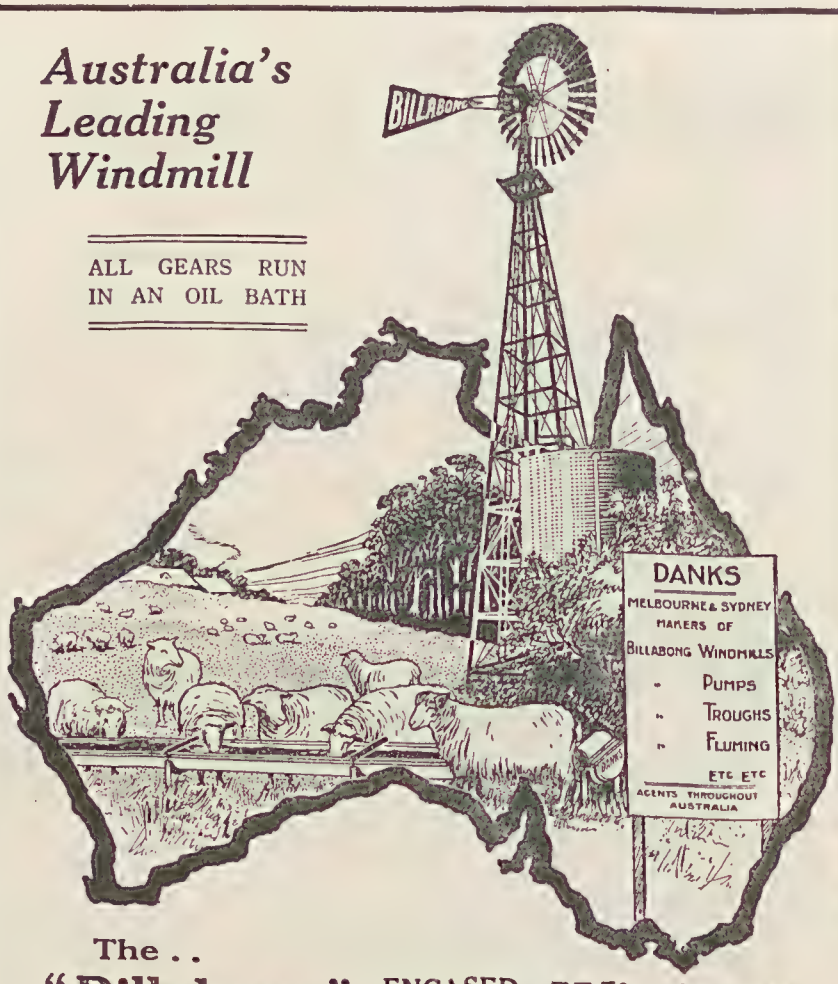

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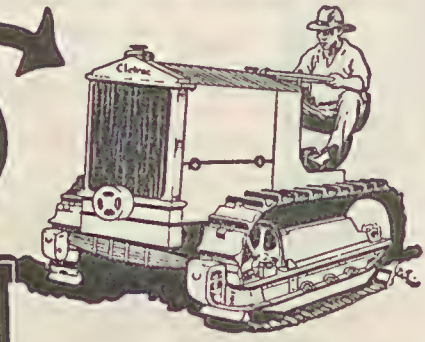

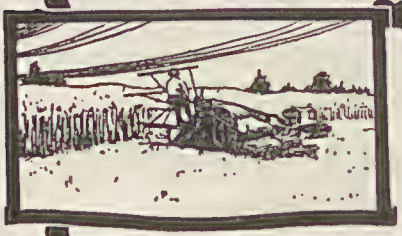

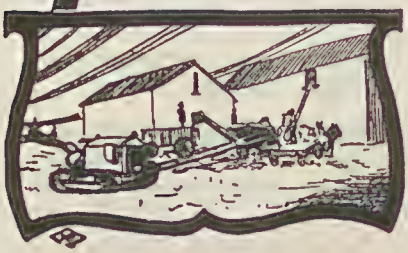

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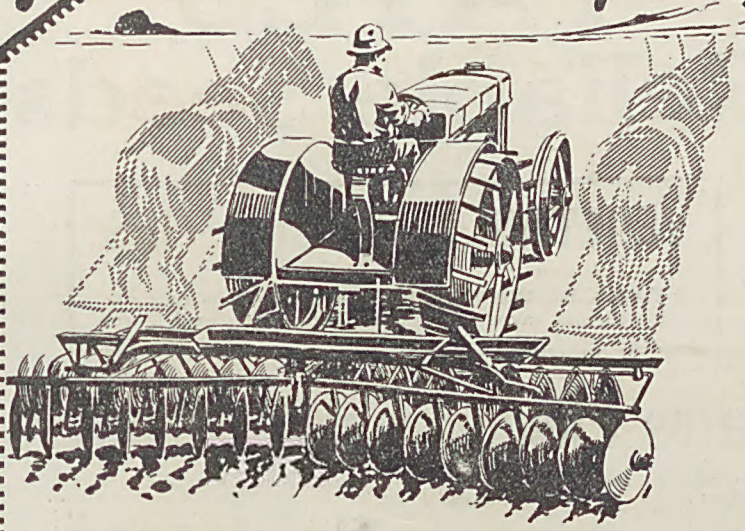

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